GOVERNMENT OF ANDHRA PRADESH

# STATE BOARD OF TECHNICAL EDUCATION AND TRAINING

## Andhra Pradesh :: AMARAVATI

**Globally Competitive**

# CURRICULUM (C-20)

## For Polytechnic Diploma Courses in Andhra Pradesh

# 3 YEAR (REGULAR) DIPLOMA IN

# CIVIL ENGINEERING

# CURRICULUM -2020

# (C-20)

## 3 YEAR (REGULAR)

## DIPLOMA IN CIVIL ENGINEERING

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**CURRICULUM -2020**
**( C-20 )**
**FOR DIPLOMA COURSES IN ANDHRA PRADESH**

## PREAMBLE

The proposed programme intends to develop a skilled technician to support the industries both nationally or globally. It also helps to kindle the spirit of entrepreneurship with necessary skills and theoretical inputs aligning with the National policy of 'Make in India'. The programme also provides for accomplishing higher education goals for those who wish to enrich their theoretical concepts further.

The State Board of Technical Education and Training, (SBTET) AP, has been offering Diploma programmes to meet the above said aspirations of the stake holders: industries, students, academia, parents and the society at large. As such, it has been the practice of SBTET, A.P., to keep the curriculum abreast with the advances in technology through systematic and scientific analysis of current curriculum and bring out an updated revised version at regular intervals. Accordingly the SBTET, AP under the aegis of the Department of Technical Education, Andhra Pradesh in it's 57$^{th}$ Board Meeting held on 05-02-2019 (vide item no: 18) resolved to update the Polytechnic Curriculum C-16 with the guidance of National Institute of Technical Teachers Training & Research (NITTTR), Extension Centre, Vijayawada (ECV), to be implemented with effect from the academic year '20-21.

Analysis of Curriculum C-16 (SWOT analysis) started in the month of June-2019. Feedback was collected from all stake holders: Students, Lecturers, Senior Lecturers, Head of Sections and Principals for all programmes for this purpose. A series of workshops with subject experts followed in the subsequent weeks and the draft curricula were prepared for every programme. Finally, an interactive session with representatives from industries, academia and subject experts was held on 04.01.2020 for thorough perusal and critique of draft curricula; and the suggestions received thus received from Industrialists and academia have been recorded , validated by another set of experienced subject teachers from the Department of Technical education for incorporation into the Curriculum C-20.

The design of new Curricula for the different diploma programmes has thus been finalised with the active participation of the members of the faculty teaching in the Polytechnics of Andhra Pradesh, and duly reviewed by Expert Committee constituted of academicians and representatives from industries. Thus, the primary objective of the curriculum change is to produce employable technicians in the country by correlating the growing needs of the industries with relevant academic input.

The outcome-based approach as given by NBA guidelines has been followed throughout the design of this curriculum is designed to meet the requirements of NBA Accreditation, too.

The revised New Curriculum i.e., Curriculum–2020 (C-20) is approved by BoG of SBTET for its implementation with effect from 2020-21.

**Highlights of Curriculum C-20:**

1. Duration of course for regular Diploma and for sandwich Diploma is 3 years and 3½ years respectively.
2. The Curriculum is prepared in Semester Pattern. However, First Year is maintained as Year-wise pattern.
3. 6 Months Industrial training has been introduced for 3 years Diploma Courses and 1 year Industrial Training is introduced for 3 ½ years Sandwich Diploma courses.
4. Updated subjects relevant to the industry are introduced in all the Diploma courses.
5. CISCO course content has been incorporated into the ECE and CME programmes for certification from CISCO in lieu of industrial training when students are unable to get Industrial Training placement in any industry.
6. The policy decisions taken at the State and Central level with regard to environmental science are implemented by including relevant topics in Chemistry. This is also in accordance with the Supreme Court guidelines issued in Sri Mehta's case.
7. Keeping in view the increased need of communication skills which is playing a major role in the success of Diploma Level students in the industries, emphasis is given for learning and acquiring listening, speaking, reading and writing skills in English. Further as emphasized in the meetings, Communication Skills lab and Life Skills lab are continuing for all the branches.
8. CAD specific to the branch has been given emphasis in the curriculum. Preparing drawings using CAD software has been given more importance.
9. Upon reviewing the existing C-16 curriculum, it is found that the theory content is found to have more Weightage than the Practical content. In C-20 curriculum, more emphasis is given to the practical content in Laboratories and Workshops, thus strengthening the practical skills.
10. With increased emphasis for the student to acquire Practical skills, the course content in all the subjects is thoroughly reviewed and structured as outcome based than the conventional procedure based.
11. Curricula of Laboratory and Workshops have been thoroughly revised based on the suggestions received from the industry and faculty, for better utilization of the equipment available in the Polytechnics. The experiments /exercises that are chosen for the practical sessions are identified to confirm to the field requirements of industry.
12. An exclusive section for assessing Higher order Thinking skills (HOTS) has been introduced in summative evaluation.

**Acknowledgements**:

It is pertinent to acknowledge the support of the following in the making of Curriculum C-20.

A series of workshops in three phases were conducted by NITTTR, AP Extension Centre, Vijayawada involving faculty from Polytechnics, Premier Engineering Colleges & Industries to analyse the Previous C-16 Curriculum and to design C-20 Curriculum under the guidance of Dr C. R. Nagendra Rao, Professor& Head, NITTTR-ECV. The efforts & support extended by NITTTR to bring out final Curriculum C-20 by incorporating needs, aspiration & expectations of all stake holders is highly appreciated and gratefully acknowledged.

The Members of the working group are grateful to Sri M.M. Nayak, I.A.S., Special Commissioner of Technical Education & Chairman of SBTET, AP. and Sri. G. Anantha Ramu, I.A.S., Principal Secretary, Department of Skill Development and Training for their guidance and valuable inputs during process of revising, modifying and updating the Curriculum C-20.

The Members acknowledge with thanks the guidance & inspiration provided by Sri. V.S. Dutt, Secretary, SBTET, Andhra Pradesh and other officials of Directorate of Technical Education and the State Board of Technical Education, Andhra Pradesh, experts from industry,

academia from the universities and higher learning institutions and all teaching fraternity from the Polytechnics who are directly or indirectly involved in preparation of the curricula.

## RULES AND REGULATIONS OF C-20 CURRICULUM

**1 DURATION AND PATTERN OF THE COURSES**

All the Diploma programs run at various institutions are of AICTE approved 3 years or 3½ years duration of academic instruction.

All the Diploma courses are run on year wise pattern in the first year, and the remaining two or two & half years are run in the semester pattern. In respect of few courses like Diploma in Bio-Medical course, the training will be in the seventh semester. Run-through system is adopted for all the Diploma Courses, subject to eligibility conditions.

**2 PROCEDURE FOR ADMISSION INTO THE DIPLOMA COURSES:**

Selection of candidates is governed by the Rules and Regulations laid down in this regard from time to time.

**a)** Candidates who wish to seek admission in any of the Diploma courses will have to appear for the Common Entrance Test for admissions into Polytechnics (POLYCET) conducted by the State Board of Technical Education and Training, Andhra Pradesh, Vijayawada.

Only the candidates satisfying the following requirements will be eligible to appear for the Common Entrance Test for admissions into Polytechnics (POLYCET).

**b)** The candidates seeking admission should have appeared for S.S.C examination, conducted by the Board of Secondary Education, Andhra Pradesh or equivalent examination thereto, at the time of applying for the Common Entrance Test for admissions into Polytechnics (POLYCET). In case of candidates whose results of their Qualifying Examinations is pending, their selection shall be subject to production of proof of their passing the qualifying examination in one attempt or compartmentally at the time of admission.

**c)** Admissions are made based on the merit obtained in the Common Entrance Test (POLYCET) and the reservation rules stipulated by the Government of Andhra Pradesh from time to time.

**d)** For admission into the following Diploma Courses for which entry qualification is 10+2, candidates need not appear for POLYCET. A separate notification will be issued for admission into these courses.

i) D.HMCT ii) D.Pharmacy

**3 MEDIUM OF INSTRUCTION**

The medium of instruction and examination shall be English.

**4 PERMANENT IDENTIFICATION NUMBER (PIN)**

A cumulative / academic record is to be maintained of the Marks secured in sessional work and end examination of each year for determining the eligibility for promotion etc., A Permanent Identification Number (PIN) will be allotted to each admitted candidate to maintain academic records.

**5 NUMBER OF WORKING DAYS PER SEMESTER / YEAR:**

a) The Academic year for all the Courses shall be in accordance with the Academic Calendar.
b) The Working days in a week shall be from Monday to Saturday
c) There shall be 7 periods of 50 minutes duration each on all working days.
d) The minimum number of working days for each semester / year shall be 90 / 180 days excluding examination days. If this prescribed minimum is not achieved due to any reason, special arrangements shall be made to conduct classes to complete the syllabus.

**6 ELIGIBILITY (ATTENDANCE TO APPEAR FOR THE END EXAMINATION)**

a) A candidate shall be permitted to appear for the end examination in all subjects, if he or she has attended a minimum of 75% of working days during the year/Semester.
b) Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester or 1st year may be granted on medical grounds.
c) A stipulated fee shall be payable towards condonation for shortage of attendance.
d) Candidates having less than 65% attendance shall be detained.
e) Students whose shortage of attendance is not condoned in any semester / 1st year and not paid the condonation fee in time are not eligible to take their end examination of that class and their admissions shall stand cancelled. They may seek re-admission for that semester / 1st year when offered in the next subsequent academic semester/year.
f) For INDUSTRIAL TRAINING:

i) During Industrial Training the candidate shall put in a minimum of 90% attendance.
ii) If the student fails to secure 90% attendance during industrial training, the student shall reappear for 6 months industrial training.

**7 READMISSION**

Readmission shall be granted to eligible candidates by the respective Principal/ Regional Joint Director.

a) (i) Within 15 days after commencement of class work in any semester (Except Industrial Training).
(ii) For Industrial Training: before commencement of the Industrial training.
b) Within 30 days after commencement of class work in any year (including D. Pharmacy course or first year course in Engineering and Non-Engineering Diploma streams).
Otherwise, such cases shall not be considered for readmission for that semester / year and are advised to seek readmission in the next subsequent eligible academic year.
The percentage of attendance of the readmitted candidates shall be calculated from the first day of beginning of the regular class work for that year / Semester, as officially announced by CTE/SBTET but not from the day on which he/she has actually reported to the class work.

## 8 SCHEME OF Evaluation

### a) First Year

**THEORY Courses**: Each Course carries Maximum marks of 80 with examination of 3 hours duration, along with internal assessment for Maximum of 20 marks. (Sessional marks). However, there are no minimum marks prescribed for sessionals.

**Laboratory Courses**: There shall be 40 Marks for internal assessment i.e. sessional marks for each practical Course with an end examination of 3 hours duration carrying 60 marks. However, there are no minimum marks prescribed for sessionals.

### b) III, IV, V, VI and VII Semesters:

**THEORY Courses**: End semester evaluation shall be of 3 hours duration and for a maximum of 80 marks.

**Laboratory Courses**: Each Course carry 60/30 marks of 3hours duration 40/20 sessional marks.

## 9 INTERNAL ASSESSMENT SCHEME

a) **Theory Courses**: Internal assessment shall be conducted for awarding sessional marks on the dates specified. **Three unit tests shall be conducted for I year students and two Unit Tests for semester students.**

Internal Assessment shall be of 90 minutes duration and for a maximum of 40 marks for each test.

The average of marks of all the test, reduced to 20 shall be taken as final sessional in any case.

b) **Practical Courses**:

(i) **Drawing Courses:**

The award of sessional marks for internal Assessment shall be as given in the following table

| **Distribution of Marks for the Internal Assessment Marks** | | | |
|---|---|---|---|
| **First Year (Total:40 Marks)** | | **Semesters (Total:40 Marks)** | |
| Max:20 Marks | Max:20 Marks | Max:20 Marks | Max:20 Marks |
| From the Average of THREE Unit Tests. | From the Average of Assessment of Regular Class work Exercises. | From the Average of TWO Unit Tests. | From the Average of Assessment of Regular Class work Exercises. |

All Drawing exercises are to be filed in **serial order** and secured for further scrutiny by a competent authority

**(ii) Laboratory Courses:**

Student's performance in Laboratories / Workshop shall be assessed during the year/ semester of study for 40 marks in each practical Course.

**Evaluation for Laboratory Courses, other than Drawing courses**:

i. Instruction (teaching) in laboratory courses (except for the course on Drawing) here after shall be task/competency based as delineated in the Laboratory sheets, prepared by SBTET, AP & NITTTR- ECV and posted in SBTET website.
ii. Internal assessment for Laboratory shall be done on the basis of task/s performed by the student as delineated in the laboratory sheets, prepared by SBTET, AP & NITTTR-ECV and posted in AP, SBTET website.
iii. Question paper for End semester Evaluation shall also be task/s based and shall be prepared and distributed by SBTET as done in case of theory courses be prepared as per SBTET rules in vogue.

c) Internal assessment in Labs / workshops / Survey field work etc., during the course of study shall be done and sessional marks shall be awarded by the concerned Teacher.

d) For practical examinations, except in drawing, there shall be two examiners. External examiner shall be appointed by the Principal in consultation with respective Head of Section preferably choosing a qualified person from the following in the order of preference.

i) Nearby Industry

ii) Govt / Semi Govt organization like R & B, PWD, PR, Railways, BSNL, APSRTC, APSEB etc.,

iii) Govt / University Engg College.

iv) HoDs from Govt.Polytechnic

Internal examiner shall be the person concerned with internal assessment as in (c) above. The end examination shall be held along with all theory papers in respect of drawing.

e) Question Paper for Practicals: Question paper should cover ( the experiments / exercise prescribed) to test various skills like handling, manipulating, testing, trouble shooting, repair, assembling and dismantling etc., from more than one experiment / exercise

f) Records pertaining to internal assessment marks of both theory and practical Courses are to be maintained for official inspection.

g) **In case of Diploma programs *having* Industrial Training, Internal Assessment and Summative Evaluation**, shall be done as illustrated in the following table:

<table>
<tr><th>Assessment no</th><th>Upon completion of</th><th>By</th><th>Based on</th><th>Max Marks</th></tr>
<tr><td>1</td><td>12 weeks</td><td rowspan="2">1.The faculty concerned and<br>2. Training Mentor of the industry</td><td rowspan="2">Learning outcomes as given in the scheme of assessment , for Industrial Training</td><td>120</td></tr>
<tr><td>2</td><td>20-22 weeks</td><td>120</td></tr>
<tr><td rowspan="3">3.Final summative Evaluation</td><td rowspan="3">23-24 weeks</td><td rowspan="3">1.The faculty member concerned,<br>2.HoD concerned and<br>3.An external examiner</td><td>1.Demonstration of any one of the skills listed in learning outcomes</td><td>30</td></tr>
<tr><td>2.Training Report</td><td>20</td></tr>
<tr><td>3.Viva Voce</td><td>10</td></tr>
<tr><td colspan="3"></td><td>TOTAL</td><td>300</td></tr>
</table>

## 10 MINIMUM PASS MARKS

**THEORY EXAMINATION**:

For passing a theory Course, a candidate has to secure a minimum of 35% in end examination and a combined minimum of 35% of both Sessional and end examination marks put together.

**PRACTICAL EXAMINATION**:

For passing a practical Course, a candidate has to secure a minimum of 50% in end examination and a combined minimum of 50% of both sessional and practical end examination marks put together. In case of D.C.C.P., the pass mark for typewriting and short hand is 45% in the end examination. There are no sessional marks for typewriting and Shorthand Courses of D.C.C.P course.

**INDUSTRIAL ASSESSMENT**:

Pass mark is 50% in Formative assessment at Industry ( I and II assessments put together) and in final summative assessment at institution put together.

## 11. PROVISION FOR IMPROVEMENT

Improvement is allowed only after he / she has completed all the Courses from First Year to Final semester of the Diploma.

a) Improvement is allowed in any 4 (Four) Courses of the Diploma.
b) The student can avail of this improvement chance **ONLY ONCE**, that too within the succeeding two examinations after the completion of Diploma. However, the duration including Improvement examination shall not exceed **FIVE** years from the year of first admission.
c) No improvement is allowed in Practical / Lab Courses or Project work or Industrial Training assessment. However, improvement in drawing Course(s) is allowed.
d) If improvement is not achieved, the marks obtained in previous Examinations hold good.
e) Improvement is not allowed in respect of the candidates who are punished under Mal-practice in any Examination.
f) Examination fee for improvement shall be paid as per the notification issued by State Board of Technical Education and Training from time to time.
g) All the candidates who wish to appear for improvement of performance shall deposit the original Marks Memos of all the years / Semesters and also original Diploma Certificate to the Board. If there is improvement in performance of the current examination, the revised Memorandum of marks and Original Diploma Certificate will be issued, else the submitted originals will be returned.

## 12. RULES OF PROMOTION FROM 1$^{ST}$ YEAR TO 3$^{rd}$, 4$^{th}$, 5$^{th}$ ,6$^{th}$ and 7$^{th}$ SEMESTERS:

**A) For Diploma Courses of 3 Years duration**

i. A candidate shall be permitted to appear for first year examination provided he / she puts in 75% attendance (which can be condoned on Medical grounds upto 10%) i.e. attendance after condonation on Medical grounds should not be less than 65% and pay the examination fee.

ii. A candidate shall be promoted to 3$^{rd}$ semester if he/she puts the required percentage of attendance in the first year and pays the examination fee. A candidate who could not pay the first year examination fee has to pay the promotion fee as prescribed by State Board of Technical Education and Training, AP from time to time before commencement of 3$^{rd}$ semester.

iii. A candidate shall be promoted to 4$^{th}$ semester provided he/she puts the required percentage of attendance in the 3$^{rd}$ semester and pay the examination fee. A candidate, who could not pay the 3$^{rd}$ semester exam fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training AP from time to time before commencement of 4$^{th}$ semester.

A candidate is eligible to appear for the 4th semester examination if he/she

a) Puts the required percentage of attendance in the 4th semester
b) Should not have failed in more than four Courses in 1st year

**For IVC & ITI Lateral Entry Students:**

a) A candidate is eligible to appear for the 4th semester examination if he/she puts the required percentage of attendance in the 4th semester
b) A candidate is eligible to appear for the 4th semester examination if he/she clears at least two Courses in third semester.

iv) A candidate shall be promoted to 5th semester provided he / she puts the required percentage of attendance in the 4th semester and pays the examination fee. A candidate, who could not pay the 4th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 5th semester.

A candidate is eligible to appear for the 5th semester examination if he/she

a) Puts the required percentage of attendance in the 5th semester
b) Should get eligibility to appear for 4th Semester examination.

The first backlog exam in 5th semester will be conducted only in instant/supplementary diploma examination.

**For IVC& ITI Lateral Entry students**:

a) Puts the required percentage of attendance in the 5th semester

v) A candidate shall be sent to Industrial training provided he/she puts in the required percentage of attendance in the 4th semester and pay the examination fee/ promotion fee as prescribed by SBTET.

A candidate is eligible to appear for Industrial Training assessment (Seminar/Viva-voce)

a) Puts the required percentage of attendance, ie., 90% in 6th semester Industrial Training

**For IVC & ITI Lateral Entry students**:

a) Puts the required percentage of attendance, ie., 90% in 6th semester Industrial Training.
b) should get eligibility to appear for 5th Semester Examination.

**B) For Diploma Courses of 3 ½ Years duration (MET/ CH/ CHPP/ CHPC/ CHOT/ TT ):**

i. A candidate shall be permitted to appear for 1st year examination provided he / she puts in 75% attendance (which can be condoned on Medical grounds upto 10%) i.e. attendance after condonation on Medical grounds should not be less than 65% and pay the examination fee.

ii. A candidate shall be promoted to 3rd semester if he/she puts the required percentage of attendance in the 1st year and pays the examination fee. A candidate who could not pay the 1st year examination fee has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 3rd semester.

iii. A candidate shall be promoted to 4th semester provided he/she puts the required percentage of attendance in the 3rd semester and pay the examination fee. A candidate, who could not pay the 3rd semester exam fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 4th semester.

A candidate is eligible to appear for the 4th semester exam if he/she

a). Puts the required percentage of attendance in the 4th semester

b). Should not have failed in more than Four backlog Courses of 1st year.

**For IVC & ITI Lateral Entry students**:

a) Puts the required percentage of attendance in the 4th semester

iv. A candidate shall be promoted to 5th semester industrial training provided he / she puts the required percentage of attendance in the 4th semester and pays the examination fee. A candidate, who could not pay the 4th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 5th semester.

v. Promotion from 5th to 6th semester is automatic (i.e., from 1st spell of Industrial Training to 2nd spell) provided he/she puts the required percentage of attendance, which in this case ie.,90 % of attendance and attends for the VIVA-VOCE examination at the end of training.

vi. A candidate shall be promoted to 7th semester provided he / she puts the required percentage of attendance in the 6th semester and pays the examination fee. A candidate, who could not pay the 6th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 7th semester.

vii. A candidate shall be promoted to 7th semester of the course provided he/she has successfully completed both the spells of Industrial Training.

A candidate is eligible to appear for 7th semester examination if he/she

a) Puts in the required percentage of attendance in the 7th semester

b) Should get eligibility to appear for 4th semester Examination.

**For IVC & ITI Lateral Entry students**:

a) Puts in the required percentage of attendance in the 7th semester

b) Should not have failed more than four backlog Courses of 3rd Semester

**C) For Diploma Courses of 3 ½ Years duration (BM):**

The same rules which are applicable for conventional courses also apply for this course. The industrial training in respect of this course is restricted to one semester (6 months) after the 6th semester (3 years) of the course.

i. A candidate shall be permitted to appear for first year examination provided he / she puts in 75% attendance (which can be condoned on Medical grounds upto 10%) i.e. attendance after condonation on Medical grounds should not be less than 65% and pay the examination fee.

ii. A candidate shall be promoted to 3rd semester if he/she puts the required percentage of attendance in the first year and pays the examination fee. A candidate who could not pay the first year examination fee has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 3rd semester.

iii. A candidate shall be promoted to 4th semester provided he/she puts the required percentage of attendance in the 3rd semester and pay the examination fee. A candidate who could not pay the 3rd semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 4th semester.

A candidate is eligible to appear for the 4th semester examination if he/she

a) Puts in the required percentage of attendance in the 4th semester
b) Should not have failed in more than Four backlog Courses of 1st year

**For IVC & ITI Lateral Entry Students:**

A candidate is eligible to appear for the 4th semester examination if he/she puts the required percentage of attendance in the 4th semester

iv. A candidate shall be promoted to 5th semester provided he / she puts the required percentage of attendance in the 4th semester and pays the examination fee. A candidate, who could not pay the 4th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 5th semester.

A candidate is eligible to appear for the 5th semester exam if he/she

a) Puts in the required percentage of attendance in the 5 th semester.
b) Should get eligibility to appear for 4th Semester examination.

**For IVC & ITI Lateral Entry students**:

a) Puts in the required percentage of attendance in the 5th semester.
b) Should not have failed in more than Four backlog Courses of 3rd Semester.

v. A candidate shall be promoted to 6th semester provided he/she puts in the required percentage of attendance in the 5th semester and pays the examination fee.

A candidate who could not pay the 5th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 6th semester.

A candidate is eligible to appear for 6th semester examination

a) Puts in the required percentage of attendance in 6th semester and
b) should get eligibility to appear for 4th Semester Examination.

**For IVC & ITI Lateral Entry students**:

a) Puts in the required percentage of attendance in 6th semester.
b) Should get eligibility to appear for 5th Semester Examination.

vi. A candidate shall be promoted to 7th semester provided he/she puts in the required percentage of attendance in 6th semester and pay the examination fee. A candidate, who could not pay the 6th semester examination fee, has to pay the promotion fee prescribed by SBTET from time to time before commencement of the 7th semester (Industrial Training).

A candidate is eligible to appear for 7th semester Industrial Training assessment (Seminar/Viva-voce) if he/she

a) Puts in the required percentage of attendance, ie., 90% in 7th semester Industrial Training
b) Should get eligibility to appear for 4th Semester Examination.

**For IVC & ITI Lateral Entry students**:

a) Puts in the required percentage of attendance, ie., 90% in 7th semester Industrial Training.
b) Should get eligibility to appear for 5th Semester Examination.

**Important Note:**

**Seminar/Viva-voce should not be conducted for Not-Eligible Candidates, till the candidate gets eligibility. However, the record of internal Assessment for Industrial Training for 260 marks shall be maintained at Institution Level for all candidates and the data is to be uploaded only for eligible candidates. For not eligible candidates the data is to be uploaded as and when the candidate gets eligibility.**

**OTHER DETAILS**

a) In case a candidate does not successfully complete the Industrial training, he / she will have to repeat the training at his / her own cost.
b) The First spell of Industrial training shall commence 10 days after the completion of the last theory examination of 4th Semester.
c) The Second spell of Industrial training shall commence within 10 days after the completion of first spell of Industrial training.

## 13. STUDENTS PERFORMANCE EVALUATION

Successful candidates shall be awarded the Diploma under the following divisions of pass.

a) First Class with Distinction shall be awarded to the candidates who secure an overall aggregate of 75% marks and above.
b) First Class shall be awarded to candidates who secure overall aggregate of 60% marks and above and below 75% marks.
c) Second Class shall be awarded to candidates who secure a pass with an overall aggregate of below 60%.

i. The Weightage of marks for various year/Semesters which are taken for computing overall aggregate shall be 25% of I year marks + 100% of 3rd and subsequent Semesters.

ii. In respect IVC & ITI Lateral Entry candidates who are admitted directly into diploma course at the 3rd semester (i.e., second year) level the aggregate of (100%) marks secured at the 3rd and subsequent semesters of study shall be taken into consideration for determining the overall percentage of marks secured by the candidates for award of class/division.

d) Second Class shall be awarded to all students, who fail to complete the Diploma in the regular 3 years/ 3 ½ years and four subsequent examinations, from the year of first admission.

**14. EXAMINATION FEE SCHEDULE:**

The examination fee should be as per the notification issued by State Board of Technical Education and Training, AP from time to time.

**15. STRUCTURE OF EXAMINATION QUESTION PAPER:**

**I. Formative assessment (Internal examination)**

**a) For theory Courses**:

Three unit tests for first year and two unit tests for semesters shall be conducted with a duration of 90 minutes for each test for maximum marks of 40. It consists of part A and Part B.

**Part A** contains five questions and carries 16 marks. Among these five questions first question consists of four objective items like one word or phrase answer/filling-in the blanks/true or false etc with one mark for each question. The other four questions are short answer questions and carry three marks each.

**Part B** carries 24 marks and consists of three questions with internal choice ie., Either/Or type , and each question carries 8 marks.

The sum of marks of 3 tests for I year and 2 tests for semesters shall be reduced to 20 marks in each Course for arriving at final sessional marks.

**b) For drawing Courses:**

**For I year:**

Three unit tests with duration of 90 minutes and for maximum marks of 40 marks shall be conducted for first year. It consists of part A and Part B.

Part A consists four questions for maximum marks of 16 and each question carries four marks (4×4 marks=16 marks).

Part B carries maximum marks of 24 and consists of five questions while the student shall answer any three questions out of these five questions. Each question in this part carries a maximum marks of 8, (3×8 marks=24 marks).

The sum of marks obtained in 3 unit test marks shall be reduced to 20 marks for arriving at final sessional marks. Remaining 20 marks are awarded by the Course teacher based on the student's performance during regular class exercise.

**For semester:** Two unit tests with duration of 90 minutes and for maximum marks of 40 marks shall be conducted. The sum of marks obtained in 2 unit test marks shall be reduced to 20 marks for arriving at final sessional marks. Remaining 20 marks are awarded by the Course teacher based on the student's performance during regular class exercise

**c) For Laboratory /workshop:** 50% of total marks for the Course shall be awarded based on continuous assessment of the student in laboratory/workshop classes and the remaining 50% shall be based on the sum of the marks obtained by the students in two tests.

**II. Summative assessment (End examination)**

The question paper for theory examination is patterned in such a manner that the Weightage of periods/marks allotted for each of the topics for a particular Course be considered. End Examination paper is of 3 hours duration.

a) **Each theory paper consists of Section 'A', 'B' and 'C'**.

**Section 'A' with Max marks of 30,** contains 10 short answer questions. All questions are to be answered and each carries 3 marks, i.e., 10 x 3 = 30.

**Section 'B' with Max marks of 40** contains 5 essay type questions including Numerical questions (without any divisions in the question), with internal choice(Either/or type), each carrying 8 marks, i.e., Max. Marks: 5 x 8 = 40.

**Section 'C' with Max marks of 10** contains single essay type, Higher order Thinking skills question (HoTs) including Numerical questions, without choice (without any divisions in the question),

**Thus the total marks for theory examination shall be: 80**.

b) **For Engineering Drawing Course (107) consist of section 'A' and section 'B'**.

**Section 'A' with max marks of 20**, contains four (4) questions. All questions in section 'A' are to be answered to the scale and each carries 5 marks, ie. 4 x 5=20.

**Section 'B' with max marks of 40,** contains six (6) questions. The student shall answer any four (4) questions out of the above six questions and each question carries 10 Marks, ie. 4 x 10 = 40.

c) **Practical Examinations**

For Workshop practice and Laboratory Examinations, Each student has to pick up a question paper distributed by Lottery System.

Max. Marks for an experiment / exercise : 50
Max. Marks for VIVA-VOCE : 10
Total Max. Marks : 60

In case of practical examinations with 30 marks, the marks shall be distributed as

Max. Marks for an experiment / exercise : 25
Max. Marks for VIVA-VOCE : 05
Total Max. Marks : 30

In case of any change in the pattern of question paper, the same shall be informed sufficiently in advance to the candidates.

d) **Note: Evaluation for Laboratory Courses, other than Drawing courses**:

I. Instruction (teaching) in laboratory courses (except for the course on Drawing) hereafter shall be task/competency based as delineated in the Laboratory sheets, prepared by SBTET, AP and posted in its website.
II. Internal assessment for Laboratory shall be done on basis of task/s performed by the student as delineated in the laboratory sheets, prepared by SBTET, AP and posted in its website.
III. Question paper for End semester Evaluation shall be prepared as per SBTET rules in vogue.

**16. ISSUE OF MEMORONDUM OF MARKS**

All candidates who appear for the end examination will be issued memorandum of marks without any payment of fee. However candidates who lose the original memorandum of marks have to pay the prescribed fee to the Secretary, State Board of Technical Education and Training, A.P. for each duplicate memo from time to time.

**17. MAXIMUM PERIOD FOR COMPLETION OF DIPLOMA Programmes:**

Maximum period for completion of the diploma courses is twice the duration of the course from the date of First admission (includes the period of detention and discontinuation of studies by student etc) failing which they will have to forfeit the claim for qualifying for the award of Diploma (They will not be permitted to appear for examinations after that date). This rule applies for all Diploma courses of 3 years and 3 ½ years of engineering and non-engineering courses.

**18. ELIGIBILITY FOR AWARD OF DIPLOMA**

A candidate is eligible for award of Diploma Certificate if he / she fulfil the following academic regulations.

i. He / She pursued a course of study for not less than 3 / 3 ½ academic years & not more than 6 / 7 academic years.

ii. He / she have completed all the Courses.

Students who fail to fulfil all the academic requirements for the award of the Diploma within 6 / 7 academic years from the year of admission shall forfeit their seat in the course & their seat shall stand cancelled.

**For IVC & ITI Lateral Entry students**:

i. He / She pursued a course of study for not less than 2 / 2 ½ academic years & not more than 4 / 5 academic years.

ii. He / she has completed all the Courses.

Students who fail to fulfill all the academic requirements for the award of the Diploma within 4 / 5 academic years from the year of admission shall forfeit their seat in the course & their seat shall stand cancelled.

## 19. ISSUE OF PHOTO COPY OF VALUED ANSWER SCRIPT, RECOUNTING& REVERIFICATION:

### A) FOR ISSUE OF PHOTO COPIES OF VALUED ANSWER SCRIPTS

I. A candidate desirous of applying for Photo copy of valued answer script/s should apply within prescribed date from the date of the declaration of the result.

II. Photo copies of valued answer scripts will be issued to all theory Courses and Drawing Course(s).

III. The Photo copy of valued answer script will be dispatched to the concerned candidate's address as mentioned in the application form by post.

IV. No application can be entertained from third parties.

### B) FOR RE-COUNTING(RC) and RE-VERIFICATION(RV) OF THE VALUED ANSWER SCRIPT

i. A candidate desirous of applying for Re-verification of valued answer script should apply within prescribed date from the date of the declaration of the result.

ii. Re-verification of valued answer script shall be done for all theory Courses' and Drawing Course(s).

iii. The Re-verification committee constituted by the Secretary, SBTETAP with Course experts shall re-verify the answer scripts.

I. **RE-COUNTING**

The Officer of SBTET will verify the marks posted and recount them in the already valued answer script. The variations if any will be recorded separately, without making any changes on the already valued answer script. The marks awarded in the original answer script are maintained (hidden).

**II. RE-VERIFICATION**

(i) The Committee has to verify the intactness and genuineness of the answer script(s) placed for Re-verification.

(ii) Initially single member shall carry out the re-verification.

(iii) On re-verification by single member, if the variation is less than 12% of maximum marks, and if there is no change in the STATUS in the result of the candidate, such cases will not be referred to the next level ie., for 2-Tier evaluation.

(iv) On re-verification by a single member, if the variation is more than 12% of maximum marks, it will be referred to 2-Tier evaluation.

(v) If the 2-Tier evaluation confirms variation in marks as more than 12% of maximum marks, the variation is considered as follows:

a) If the candidate has already passed and obtains more than 12% of the maximum marks on Re-verification, then the variation is considered.

b) If the candidate is failed and obtains more than 12% of the maximum marks on Re-verification and secured pass marks on re-verification, then the status of the candidate changes to PASS.

c) If a candidate is failed and obtains more than 12% of the maximum marks on Re-verification and if the marks secured on re-verification are still less than the minimum pass marks, the status of the candidate remain FAIL only.

(vii) After Re-verification of valued answer script the same or change if any therein on Re-verification, will be communicated to the candidate.

(viii) On Re-verification of Valued Answer Script if the candidate's marks are revised, the fee paid by the candidate will be refunded or else the candidate has to forfeit the fee amount.

**Note:** No request for Photo copies/ Recounting /Re-verification of valued answer script would be entertained from a candidate who is reported to have resorted to Malpractice in that examination.

**20. MALPRACTICE CASES:**

If any candidate resorts to Mal Practice during examinations, he / she shall be booked and the Punishment shall be awarded as per SBTETAP rules and regulations in vogue.

**21. DISCREPANCIES/ PLEAS:**

Any Discrepancy /Pleas regarding results etc., shall be represented to the SBTETAP within one month from the date of issue of results. Thereafter, no such cases shall be entertained in any manner.

**22. ISSUE OF DUPLICATE DIPLOMA**

If a candidate loses his/her original Diploma Certificate and desires a duplicate to be issued he/she should produce written evidence to this effect. He / she may obtain a duplicate from the Secretary, State Board of Technical Education and Training, A.P., on payment of prescribed fee and on production of an affidavit signed before a First Class Magistrate (Judicial) and non-traceable certificate from the Department of Police. In case of damage of original Diploma Certificate, he / she may obtain a duplicate certificate by surrendering the original damaged certificate on payment of prescribed fee to the State Board of Technical Education and Training, A.P.

In case the candidate cannot collect the original Diploma within 1 year from the date of issue of the certificate, the candidate has to pay the penalty prescribed by the SBTET AP from time to time.

**23. ISSUE OF MIGRATION CERTIFICATE AND TRANSCRIPTS:**

The Board on payment of prescribed fee will issue these certificates for the candidates who intend to prosecute Higher Studies in India or Abroad.

**24. The following specific changes are discussed and incorporated:**

All the courses in earlier curricula are reviewed and the following specific changes are discussed and incorporated.

i) The topic of "Advanced Surveying using GIS & GPS" was introduced in "Surveying-II (C-304)" at III semester level.

ii) In "Surveying-II practice & plotting (C-308)", a survey camp of 6-days duration is introduced to acquaint the student with the use and integration of skills already acquired by him with different surveying instruments. This survey camp is made mandatory for formative assessment.

iii) The need for having a topic on "Planning & Orientation of Buildings" is felt & suggested by industry people in the Visakhapatnam workshop. As such it is incorporated as one of the topics in the course "Construction Practice (C-306)"

iv) The course Quantity Surveying in C-16 curriculum is now divided into two courses, as "Quantity Surveying-I (C-403)" & "Quantity Surveying-II (C-503)" to accommodate more exercises on various topics.

v) A new laboratory course "Surveying-III Practice (C-409)" is introduced at IV semester level with topics on Field exercises in Total Station, GPS & digitization of Maps. A two days camp of 14 hours duration is made mandatory under this course for formative assessment.

vi) The topics on 'Tests on Concrete', 'Tests on Soils' are shifted from 'Material Testing Lab' and included in the newly introduced course, "Concrete & Soil Testing Practice (C-509)". Tests on aggregates appropriate to Highway construction and NDT on Concrete are also included in the new course.

vii) Two new courses, viz., "Construction failures, repairs & maintenance (C-504)", "Quality Control & Safety in Construction (C-505)" are introduced at V semester, keeping in view the increasing need of supervisory functioning.

viii) The course "Project Management for Construction" in C-16 curriculum is appropriately renamed as "Construction Management & Entrepreneurship(C-506)", and hence the topic 'Concrete Technology' is shifted to the course on "Construction Materials (C-305)".

ix) In "CAD Practice-II (C-510)", structural engineering drawings are included in addition to the existing drawings of irrigation, public health, culverts & bridges.

x) The question paper pattern for summative assessment for drawing Subjects except for 'Engineering Drawing' in I year is changed as mentioned in the blue print given for each drawing subject.

xi) The pattern of formative and summative assessment for "Industrial Training (C-601) is modified, assessing all the skills and competencies needed and acquired by the student during his training in industry.

**25. GENERAL**

i. The Board may change or amend the academic rules and regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students, for whom it is intended, with effect from the dates notified by the competent authority.

ii. All legal matters pertaining to the State Board of Technical Education and Training, AP are within the jurisdiction of Vijayawada.

iii. In case of any ambiguity in the interpretation of the above rules, the decision of the Secretary, SBTET, A.P is final.

## C-20 Curriculum for DCE
## With Industrial training(In-house) in Semester VI

| **VISION** |
|---|
| Develop Civil Engineering professionals competent to face the global challenges in a progressive environment conducive to learn technical knowledge, skills blended with ethics and values, to serve the society and to better it for a happy and comfortable living. |

### MISSION

| | |
|---|---|
| M1 | To provide a competitive learning environment, through a need based curriculum designed in collaboration with industry, conducive for high quality education emphasising on transfer of knowledge and skill development essential for the profession and the society as well. |
| M2 | To nurture higher order leadership qualities and ethics and values in students to enable them to be leaders in their chosen professions while maintaining the highest level of ethics. |
| M3 | To encourage the spirit of inquisition to promote innovation and entrepreneurship strengthened with life skills to sustain the stress. |
| M4 | To foster effective interactions and networking with all the stake holders so as to work towards the growth and sustainability of the society and environment. |

**PROGRAMME OUTCOMES(POs)**

1. **Basic and discipline specific knowledge**: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.
2. **Problem analysis**: Identify and analyse well-defined engineering problems using codified standard methods.
3. **Design/Development of solutions**: Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs .
4. **Engineering tools, Experimentation and Testing**: Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.
5. **Engineering practices for society, sustainability and environment**: Apply appropriate technology in context of society, sustainability, environment and ethical practices.
6. **Project Management**: Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well defined engineering activities.
7. **Life-long learning**: Ability to analyse individual needs and engaging updating in the context of technological changes.

**PROGRAMME SPECIFIC OUTCOMES (PSOs)**

1. An ability to apply disciplines - specific knowledge to solve core and/or applied Civil Engineering problems.
2. An ability to plan and perform experiments and practices and to use the results to solve Civil Engineering problems.
3. Apply appropriate technologies and tools with an understanding of the limitations.

**DIPLOMA IN CIVIL ENGINEERING**
**SCHEME OF INSTRUCTION AND MODEL BLUE PRINT FOR EVALUATION**
**CURRICULUM-2020**
**FIRST YEAR**

| Sub Code | Name of the Subject | Instruction Periods/Week | | Total Periods Per Year | Scheme Of Examination | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | | Duration (hrs) | Sessional Marks | End Exam Marks | Total Marks |
| **THEORY** | | | | | | | | |
| **C-101** | English | 3 | | 90 | 3 | 20 | 80 | 100 |
| **C-102** | Engineering Mathematics – I | 5 | | 150 | 3 | 20 | 80 | 100 |
| **C-103** | Engineering Physics | 4 | | 120 | 3 | 20 | 80 | 100 |
| **C-104** | Engineering Chemistry and Environmental studies | 4 | | 120 | 3 | 20 | 80 | 100 |
| **C-105** | Engineering Mechanics | 5 | | 150 | 3 | 20 | 80 | 100 |
| **C-106** | Surveying-I | 3 | | 90 | 3 | 20 | 80 | 100 |
| **PRACTICAL** | | | | | | | | |
| **C-107** | Engineering Drawing | - | 6 | 180 | 3 | 40 | 60 | 100 |
| **C-108** | Surveying - I Practice & Plotting | - | 4+2 | 180 | 3 | 40 | 60 | 100 |
| **C-109** | CE-109(A) : Physics Laboratory | - | 3 | 45+45 | 1½ | 20 | 30 | 50 |
| | CE-109(B): Chemistry Laboratory | - | | | 1½ | 20 | 30 | 50 |
| **C-110** | Computer Fundamentals Practice | - | 3 | 90 | 3 | 40 | 60 | 100 |
| | **Total** | **24** | **18** | **1260** | | **280** | **720** | **1000** |

**DIPLOMA IN CIVIL ENGINEERING**
**SCHEME OF INSTRUCTION AND MODEL BLUE PRINT FOR EVALUATION**
**CURRICULUM-2020**

**THIRD SEMESTER**

| Sub Code | Name of the Subject | Instruction Periods/Week | | Total Periods Per Year | Scheme Of Examination | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | | Duration (hrs) | Sessional Marks | End Exam Marks | Total Marks |
| **THEORY** | | | | | | | | |
| **C-301** | Engineering Mathematics –II | 4 | | 60 | 3 | 20 | 80 | 100 |
| **C-302** | Mechanics of Solids & Theory of Structures | 5 | | 75 | 3 | 20 | 80 | 100 |
| **C-303** | Hydraulics | 5 | | 75 | 3 | 20 | 80 | 100 |
| **C-304** | Surveying-II | 4 | | 60 | 3 | 20 | 80 | 100 |
| **C-305** | Construction Materials | 4 | | 60 | 3 | 20 | 80 | 100 |
| **C-306** | Construction Practice | 4 | | 60 | 3 | 20 | 80 | 100 |
| **PRACTICAL** | | | | | | | | |
| **C-307** | Civil Engineering Drawing-I | - | 6 | 90 | 3 | 40 | 60 | 100 |
| **C-308** | Surveying - II Practice & Plotting | - | 4 | 60 | 3 | 40 | 60 | 100 |
| **C-309** | Material Testing Practice | - | 3 | 45 | 3 | 40 | 60 | 100 |
| **C-310** | Hydraulics Practice | - | 3 | 45 | 3 | 40 | 60 | 100 |
| | **Total** | **26** | **16** | **630** | | **280** | **720** | **1000** |

**DIPLOMA IN CIVIL ENGINEERING**
**SCHEME OF INSTRUCTION AND MODEL BLUE PRINT FOR EVALUATION**
**CURRICULUM-2020**

**FOURTH SEMESTER**

| Sub Code | Name of the Subject | Instruction Periods/Week | | Total Periods Per Year | Scheme Of Examination | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | | Duration (hrs) | Sessional Marks | End Exam Marks | Total Marks |
| **THEORY** | | | | | | | | |
| **C-401** | Engineering Mathematics-III | 3 | | 45 | 3 | 20 | 80 | 100 |
| **C-402** | Design and Detailing of R.C.Structures | 5 | | 75 | 3 | 20 | 80 | 100 |
| **C-403** | Quantity Surveying-I | 5 | | 75 | 3 | 20 | 80 | 100 |
| **C-404** | Transportation Engineering | 5 | | 75 | 3 | 20 | 80 | 100 |
| **C-405** | Irrigation Engineering | 4 | | 60 | 3 | 20 | 80 | 100 |
| **PRACTICAL** | | | | | | | | |
| **C-406** | Civil Engineering Drawing-II | | 6 | 90 | 3 | 40 | 60 | 100 |
| **C-407** | Concrete & Soil Testing Practice | | 4 | 60 | 3 | 40 | 60 | 100 |
| **C-408** | Communication Skills | | 3 | 45 | 3 | 40 | 60 | 100 |
| **C-409** | Surveying-III Practice | | 3 | 45 | 3 | 40 | 60 | 100 |
| **C-410** | CAD Practice-I | | 4 | 60 | 3 | 40 | 60 | 100 |
| | **Total** | **22** | **20** | **630** | | **300** | **700** | **1000** |

**DIPLOMA IN CIVIL ENGINEERING**
**SCHEME OF INSTRUCTION AND MODEL BLUE PRINT FOR EVALUATION**
**CURRICULUM-2020**

**FIFTH SEMESTER**

| Sub Code | Name of the Subject | Instruction Periods/Week | | Total Periods Per Year | Scheme Of Examination | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | | Duration (hrs) | Sessional Marks | End Exam Marks | Total Marks |
| **THEORY** | | | | | | | | |
| **C-501** | Steel Structures | 4 | | 60 | 3 | 20 | 80 | 100 |
| **C-502** | Environmental Engineering | 5 | | 75 | 3 | 20 | 80 | 100 |
| **C-503** | Quantity Surveying-II | 4 | | 60 | 3 | 20 | 80 | 100 |
| **C-504** | Construction Failures, Repairs & Maintenance | 3 | | 45 | 3 | 20 | 80 | 100 |
| **C-505** | Quality Control and Safety in Construction | 4 | | 60 | 3 | 20 | 80 | 100 |
| **C-506** | Construction Management & Entrepreneurship | 3 | | 45 | 3 | 20 | 80 | 100 |
| **PRACTICAL** | | | | | | | | |
| **C-507** | Structural Engineering Drawing | | 3 | 45 | 3 | 40 | 60 | 100 |
| **C-508** | Life Skills | | 3 | 45 | 3 | 40 | 60 | 100 |
| **C-509** | Field Practices | | 7 | 105 | 3 | 40 | 60 | 100 |
| **C-510** | CAD Practice-II | | 6 | 90 | 3 | 40 | 60 | 100 |
| | **Total** | **23** | **19** | **630** | | **280** | **720** | **1000** |

**DIPLOMA IN CIVIL ENGINEERING**
**SCHEME OF INSTRUCTION AND MODEL BLUE PRINT FOR EVALUATION**
**CURRICULUM-2020**

**SIXTH SEMESTER**

| Sl. No. | Subject | Duration | Scheme of evaluation | | |
|---|---|---|---|---|---|
| | | | **Item** | **Nature** | **Max. Marks** |
| 1 | Industrial Training | 6 months | 1.First Assessment at Industry<br>(After 12 Weeks) | Assessment of Learning outcomes by both the faculty and training Mentor of the industry | **120** |
| | | | 2.Second Assessment at the Industry<br>(After 22 weeks) | Assessment of Learning outcomes by both the faculty and training Mentor of the industry | **120** |
| | | | Final Summative assessment at institution l<br>(After 24 weeks) | Training Report | **20** |
| | | | | Demonstration of any one of the skills listed in learning outcomes | **30** |
| | | | | **Viva Voce** | **10** |
| **TOTAL MARKS** | | | | | **300** |

- The Industrial Training shall carry 300 marks and pass mark is 50% in assessment at industry (first and second assessment put together) and in final summative assessment at institution put together
- If the student fails to secure 50% marks in final summative assessment at institution level, the student shall reappear for final summative assessment, in the subsequent board examination.
- During Industrial Training the candidate shall put in a minimum of 90% attendance. If the student fails to secure 90% attendance during industrial training, the student should reappear for 6 months industrial training.

# FIRST YEAR

**DIPLOMA IN CIVIL ENGINEERING**
**SCHEME OF INSTRUCTION AND MODEL BLUE PRINT FOR EVALUATION**
**CURRICULUM-2020**
**FIRST YEAR**

| Sub Code | Name of the Subject | Instruction Periods/Week | | Total Periods Per Year | Scheme Of Examination | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | | Duration (hrs) | Sessional Marks | End Exam Marks | Total Marks |
| **THEORY** | | | | | | | | |
| **C-101** | English | 3 | | 90 | 3 | 20 | 80 | 100 |
| **C-102** | Engineering Mathematics – I | 5 | | 150 | 3 | 20 | 80 | 100 |
| **C-103** | Engineering Physics | 4 | | 120 | 3 | 20 | 80 | 100 |
| **C-104** | Engineering Chemistry and Environmental studies | 4 | | 120 | 3 | 20 | 80 | 100 |
| **C-105** | Engineering Mechanics | 5 | | 150 | 3 | 20 | 80 | 100 |
| **C-106** | Surveying-I | 3 | | 90 | 3 | 20 | 80 | 100 |
| **PRACTICAL** | | | | | | | | |
| **C-107** | Engineering Drawing | - | 6 | 180 | 3 | 40 | 60 | 100 |
| **C-108** | Surveying - I Practice & Plotting | - | 4+2 | 180 | 3 | 40 | 60 | 100 |
| **C-109** | CE-109(A) : Physics Laboratory | - | 3 | 45+45 | 1½ | 20 | 30 | 50 |
| | CE-109(B): Chemistry Laboratory | - | | | 1½ | 20 | 30 | 50 |
| **C-110** | Computer Fundamentals Practice | - | 3 | 90 | 3 | 40 | 60 | 100 |
| | **Total** | **24** | **18** | **1260** | | **280** | **720** | **1000** |

**English**

| Course Code | Course Title | No. of Periods/Week | Total No. of Periods | Marks for FA | Marks for SA |
|---|---|---|---|---|---|
| C-101 | English | 3 | 90 | 20 | 80 |

| S. No. | Unit Title | No of Periods | COs Mapped |
|---|---|---|---|
| 1 | English for Employability | 8 | CO1, CO2, CO3, CO4 |
| 2 | Living in Harmony | 8 | CO1, CO2, CO3, CO4 |
| 3 | Connect with Care | 8 | CO1, CO2, CO3, CO4 |
| 4 | Humour for Happiness | 8 | CO1, CO2, CO3, CO4 |
| 5 | Never Ever Give Up! | 8 | CO1, CO2, CO3, CO4 |
| 6 | Preserve or Perish | 9 | CO1, CO2, CO3, CO4 |
| 7 | The Rainbow of Diversity | 8 | CO1, CO2, CO3, CO4 |
| 8 | New Challenges- Newer Ideas | 8 | CO1, CO2, CO3, CO4 |
| 9 | The End Point First! | 8 | CO1, CO2, CO3, CO4 |
| 10 | The Equal Halves | 8 | CO1, CO2, CO3, CO4 |
| 11 | Dealing with Disaster | 9 | CO1, CO2, CO3, CO4 |
| **Total Periods** | | **90** | |

| | |
|---|---|
| **Course Objectives** | To improve the skills of English Language use by enriching vocabulary and learning accurate structures for effective communication. |
| | To comprehend themes for value based living in professional and personal settings. |

| CO No. | Course Outcomes |
|---|---|
| CO1 | Applies perceptions of themes related to societal responsibility of adolescents towards their surroundings. |
| CO2 | Demonstrates knowledge of form and function of 'grammar items' and use them in both academic and everyday situations. |
| CO3 | Demonstrates effective English communication skills with competence in listening, speaking, reading and writing in academic, professional and everyday contexts. |
| CO4 | Displays positivity and values of harmonious living in personal and professional spheres as reflected through communication. |

**CO-PO Matrix**

<table>
<tr><th>Course Code<br><br>C-101</th><th colspan="4">Course Title: English<br><br>Number of Course Outcomes: 4</th><th>No. of Periods: 90</th></tr>
<tr><th rowspan="2">POs</th><th rowspan="2">Mapped with CO No.</th><th colspan="2">CO Periods Addressing PO in Column 1</th><th rowspan="2">Level of Mapping<br><br>(1,2,3)</th><th rowspan="2">Remarks</th></tr>
<tr><th>Number</th><th>Percentage</th></tr>
<tr><td>PO1</td><td></td><td colspan="4" rowspan="4">Not directly Applicable for English course, however activities that use content from science and technology relevant to the Programme taken up by the student shall be exploited for communication in the Course.</td></tr>
<tr><td>PO2</td><td></td></tr>
<tr><td>PO3</td><td></td></tr>
<tr><td>PO4</td><td></td></tr>
<tr><td>PO5</td><td>CO1, CO2, CO3, CO4</td><td>20</td><td>22</td><td></td><td rowspan="3">>50%: Level 3<br><br>21-50%: Level 2<br><br>Up to 20%: Level 1</td></tr>
<tr><td>PO6</td><td>CO1, CO2, CO3, CO4</td><td>52</td><td>58</td><td></td></tr>
<tr><td>PO7</td><td>CO1, CO2, CO3, CO4</td><td>18</td><td>20</td><td></td></tr>
</table>

Level 3 – Strongly Mapped
Level 2- Moderately Mapped
Level 1- Slightly Mapped

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 |
|---|---|---|---|---|---|---|---|
| **CO 1** | | | | | ✓ | ✓ | ✓ |
| **CO 2** | | | | | ✓ | ✓ | ✓ |
| **CO3** | | | | | ✓ | ✓ | ✓ |
| **CO 4** | | | | | ✓ | ✓ | ✓ |

**NOTE:** CO-PO groups shall be fulfilled through activities that use content from science and technology relevant to the Programme taken up by the student shall be exploited for communication in the Course.

**PO5:** Appropriate quiz programme may be conducted at intervals and duration as decided by concerned teacher.

**PO6:** Seminars on applications of mathematics in various engineering disciplines are to be planned and conducted.

**PO7:** Such activities are to be planned that students visit library to refer standard books on Mathematics and latest updates in reputed national and international journals, attending seminars, learning mathematical software tools.

**Blue Print of Question Paper:**

| S. No. | Name of the Unit | Periods Allocated | Weightage Allocated | Marks Wise Distribution of Weightage | | | | Question Wise Distribution of Weightage | | | | CO's Mapped |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | R | U | Ap | An | R | U | Ap | An | |
| 1 | English for Employability | 8 | 17 | 3 | 8* | | | 1 | 1* | 1* | | CO1, CO2, CO3, CO4 |
| 2 | Living in Harmony | 8 | | 3 | | | | 1 | | | | CO1, CO2, CO3, CO4 |
| 3 | Connect with Care | 8 | | | | 3 | | | | | | CO1, CO2, CO3, CO4 |
| 4 | Humour for Happiness | 8 | 14 | | 3 | 8* | | | 1 | 1* | | CO1, CO2, CO3, CO4 |
| 5 | Never Ever Give Up! | 8 | | | 3 | | | | 1 | | | CO1, CO2, CO3, CO4 |
| 6 | Preserve or Perish | 9 | 14 | | 8* | 3 | | | 1* | 1 | | CO1, CO2, CO3, CO4 |
| 7 | The Rainbow of Diversity | 8 | | | | 3 | 10* | | | 1 | | CO1, CO2, CO3, CO4 |
| 8 | New Challenges - Newer Ideas | 8 | 35 | | 8* | 8*+ 3+3+ 3 | | | 1* | 4 | 1* | CO1, CO2, CO3, CO4 |
| 9 | The End Point First! | 8 | | | | | | | | | | CO1, CO2, CO3, CO4 |
| 10 | The Equal Halves | 8 | | | | | | | | | | CO1, CO2, CO3, CO4 |
| 11 | Dealing with Disasters | 9 | | | | | | | | | | CO1, CO2, CO3, CO4 |
| **TOTAL** | | **90** | **80** | **6** | **30** | **34** | **10** | **2** | **5** | **8** | **1** | |

| | |
|---|---|
| PART-A: 10 Questions 3 marks each =30 Marks | All Questions are compulsory : 60 minutes |
| PART-B: 5 Questions 8 marks each =40 Marks | Internal choice : 90 minutes |
| Part-C: 1 Question 10 marks =10 Marks (Higher Order Question) | No choice, one compulsory question : 30 minutes |
| **NOTE: * indicates questions can be given from any of the corresponding lessons in the blue print.** | |

**Question Paper Pattern for Unit Tests**

Part A: 16 marks: 4 questions with 1 mark each (FIB, True/false, one word/phrase, etc.)
4 questions with 3 marks each (short answer/ descriptive/ applicative questions)
Part B: 24 marks: 3 questions 8 marks each with internal choice

**Learning Outcomes**

**1. English for Employability**

1.1. Explain the need for improving communication in English for employability
1.2. Use adjectives and articles effectively while speaking and in writing
1.3. Write simple sentences

**2. Living in Harmony**

2.1. Develop positive self-esteem for harmonious relationships
2.2. Use affixation to form new words
2.3. Use prepositions and use a few phrasal verbs contextually

**3. Connect with Care**

3.1. Use social media with discretion
3.2. Speak about abilities and possibilities
3.3. Make requests and express obligations
3.4. Use modal verbs and main verbs in appropriate form
3.5. Write short dialogues for everyday situations

**4. Humour for Happiness**

4.1. Explain the importance of humour for a healthy living
4.2. Improve vocabulary related to the theme
4.3. Display reading and speaking skills
4.4. Frame sentences with proper Subject – Verb agreement
4.5. Explain the features of a good paragraph and learn how to gather ideas as a preliminary step for writing a good paragraph.

**5. Never Ever Give Up!**

5.1. Practice to deal with failures in life.
5.2. Use the present tense form for various every day communicative functions such as speaking and writing about routines, professions, scientific descriptions and sports commentary.
5.3. Write paragraphs with coherence and other necessary skills.

**6. Preserve or Perish**

6.1. Describe the ecological challenges that we face today and act to save the environment.
6.2. Narrate / Report past events.
6.3. Develop vocabulary related to environment.
6.4. Write e-mails.

**7. The Rainbow of Diversity**

7.1. Illustrate and value other cultures for a happy living in multi-cultural workspace
7.2. Use different types of sentences

7.3. Ask for or give directions, information, instructions
7.4. Use language to express emotions in various situations
7.5. Write letters in various real life situations

**8. New Challenges – Newer Ideas**

8.1. Explain the functional difference between Active Voice and Passive Voice
8.2. Use Passive Voice to speak and write in various contexts
8.3. List the major parts and salient features of an essay
8.4. Explain latest innovations and get motivated

**9. The End Point First!**

9.1. Illustrate the importance of setting a goal in life
9.2. Report about what others have said both in speaking and writing
9.3. Write an essay following the structure in a cohesive and comprehensive manner
9.4. Apply the words related to Goal Setting in conversations and in life

**10. The Equal Halves**

10.1. Value the other genders and develop a gender-balanced view towards life
10.2. Identify the use of different conjunctions in synthesising sentences
10.3. Write various types of sentences to compare and contrast the ideas
10.4. Apply the knowledge of sentence synthesis in revising and rewriting short essays
10.5. Develop discourses in speech and writing

**11. Dealing with Disasters**

11.1. Speak and write about different kinds of disasters and the concept of disaster management
11.2. Generate vocabulary relevant to disaster management and use it in sentences
11.3. Analyze an error in a sentence and correct it
11.4. Write different kinds of reports

**Textbook:** INTERACT (A Textbook for I Year English) - Published by SBTET, AP

**Reference Books:**


| | | |
|---|---|---|
| Martin Hewings | : | Advanced Grammar in Use, Cambridge University Press |
| Murphy, Raymond | : | English Grammar in Use,Cambridge University Press |
| Sidney Greenbaum | : | Oxford English Grammar, Oxford University Press |
| | | Wren and Martin (RevisedByN.D.V. Prasad Rao) |
| | : | English Grammar and Composition, Blackie ELT Books, S. Chand and Co. |
| Sarah Freeman | : | Strengthen Your Writing, Macmillan |

**STATE BOARD OF TECHNICAL EDUCATION –A.P**

**C20- C-101-ENGLISH**

**UNIT TEST-1**

**Time: 90 minutes** **Max. Marks: 40**

**PART-A** **4X4= 16 marks**

**Instructions: Answer all the questions. Each question carries FOUR Marks.**

1. Rewrite / Fill in the blank as directed. Each question carries ½ Mark. **(CO2)**
   a) Write the antonym of 'cruel'
   b) Write the synonym of 'love'
   c) Give prefix to 'adventure'.
   d) Give suffix to ' liberate'
   e) It is _____ universal truth. (Fill in with suitable article)
   f) The boy is fond ____ ice-cream. ( Fill in the blank with proper preposition)
   g) He ____not like sweets. (Fill in the blank with correct primary auxiliary verb.)
   h) We _____ respect our national flag. ( Fill in with a proper modal verb)
2. Rewrite the sentences as directed. Each question carries One mark. 4X1=4 Marks **(CO2)**
   a) No other metal is so useful as iron. ( Change into superlative degree)
   b) Very few students are so clever as Ramesh. ( Change into comparative degree)
   c) Guess the contextual meaning of the italicized word in the following sentence.
   "The CBI officer has *interrogated* the bank employees in connection with the scam."
   d) only sings plays Prasanth not also well but cricket. ( Rearrange the jumbled words)
3. Fill in the blanks with proper form of the verb given in brackets. 4X1 = 4 marks **(CO2)**
   The IPSGM _____(hold) in our college last month. Nearly all the colleges in our zone _____(participate) in the event. The prizes _____ (distribute) by the district collector. Next year, Government Polytechnic, Vijayawada _____ (conduct) the games meet.
4. Rewrite the following sentences after making necessary corrections: 4X 1= 4 Marks **(CO3)**
   a) The police has arrested the culprit.
   b) Three hundred miles are a long distance.
   c) The Principal along with the Heads of Sections have visited the laboratories.
   d) Either he or I is to blame.

**PART-B** **3X8=24 Marks**

**Instructions: Answer all the questions and each question carries EIGHT marks.**

5. Write a dialogue of at least five turns between a shopkeeper and customer about buying a mobile phone. **(CO3)**

**6.** Make an analysis and write a paragraph in around 100 words about your strengths and weaknesses in learning and using English and also the measures to improve it. **(CO3)**

7. Write a paragraph in about 100 words on how to overcome low esteem and negativity. **(CO3, CO4)**

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**STATE BOARD OF TECHNICAL EDUCATION –A.P**

**C20-C-101-ENGLISH**

**UNIT TEST-II**

**Time: 90 minutes** **Max. Marks: 40**

**PART-A** **4X4= 16 Marks**

**Instructions: Answer all the questions. Each question carries FOUR marks.**

1. Match the words in column A with their corresponding meanings in column B **(CO2)**

| **Column A** | **Column B** |
|---|---|
| a) Deserve | i) continuous |
| b) hidden | ii) protect |
| c) Preserve | iii) worthy |
| d) Incessant | iv) praise |
| | v) unseen |
| | vi) affection |

2. Rewrite as directed: **(CO3)**
   a) You ask your Mom to give you another chocolate. ( Change into a request)
   b) The baby fell down and got injured. ( Change into an exclamatory sentence)
   c) The match was very interesting. ( Frame a question using 'how')
   d) Hemanth submitted his project report last week. (Frame Yes-No question)
3. Fill in the blanks with appropriate forms of verbs given in brackets: **(CO2)**
   a) The Sun _____ (set) in the west.
   b) Balu _____ (sing) for over fifty years in the films.
   c) We _____ (see) a camel on the road yesterday.
   d) They _____(enter) the stadium before the gates were closed.
4. Change the voice of the following: **(CO2)**
   a) Marconi invented the radio.
   b) Sravanthi has been offered a job.
   c) Pragathi can type the letter.
   d) The Chief Guest will be received by the Final year students.

**PART-B** **3X8=24 Marks**

**Answer all the questions. Each question carries EIGHT marks.**

5. Write a letter to your younger brother motivating him to deal with failures and hurdles in life. **(CO3)**
6. Write an essay in around120 words on the role of robots in the modern world. **(CO3)**
7. Read the following passage and answer the questions that follow: **(CO3)**

   The greatest enemy of mankind, as people have discovered, is not science, but war. Science merely reflects the social forces by which it is surrounded. It was found that when there is peace, science is constructive when there is war, science is perverted to destructive end. The weapons which science gives us do not necessarily create war. These make war increasingly more terrible. Until now, it has brought us on the doorstep of doom. Our main problem, therefore, is not to curb science, but to substitute law for force, and international government for anarchy in the relations of one nation with another. That is a job in which everybody must participate, including the

scientists. Now we are face to face with these urgent questions: Can education and tolerance, understanding and creative intelligence run fast enough to keep us side by side without our mounting capacity to destroy? That is the question which we shall have to answer, one way or the other, in this generation. Science must help us in the answer, but the main decision lies within ourselves. The hour is late and our work has scarcely begun.

a. What is the chief enemy of man?
b. What does science reflect?
c. When is science perverted?
d. What makes war more terrible?
e. Why do we need international government?
f. What are the four aspects that may stop destruction?
g. Have we really started our work to fight the problem discussed?
h. Pick the word from the passage that would mean: 'replace with other one'

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**STATE BOARD OF TECHNICAL EDUCATION –A.P**

**C20-C-101-ENGLISH**

**UNIT TEST-III**

**Time: 90 minutes** **Max. Marks: 40**

**PART-A 4X4 = 16 Marks**

**Instructions: Answer all the questions. Each question caries Four marks.**

1. Give the meaning of the word in italics: **( CO3)**
   a) When the girls laughed in the class, the teacher was *furious.*
   b) He was *rusticated* from the school for his misbehaviour.
   c) Vikramaditya was a *benevolent* Indian King.
   d) We should not show any *discrimination* between boys and girls.
2. Change the speech of the following: **(CO2)**
   a) He said, "I am sorry."
   b) The teacher said to the boys, "Why are you late?"
   c) Sushma said that she had submitted her report recently.
   d) Pratap requested Priya to give him her pen.
3. Rewrite as directed: **(CO2)**
   a) Though he was weak, he took the test. ( change into a simple sentence)
   b) You must work hard to achieve success. ( change into a complex sentence)
   c) If you run fast, you will catch the bus. ( change into a compound sentence)
   d) The fog disappeared when the Sun rose. ( Split into two simple sentences)
4. Locate eight errors from the following passage and correct them. **(CO2)**

   Once upon a time there live a king who was very kind to his people. In his council of ministers, there is a wise man. He had a son called Sumanth who was a educated and highly learned. Once the wise minister fall sick. All the physicists in the country could not heal him. Then Sumanth will go in search of medicine in Himalayas. He bring the special medicinal roots to cure his father's sickness. Sumanth looked before his father carefully and healed him. The king rewarded Sumanth with rich gifts.

**PART- B 3X8 = 24 Marks**

**Instructions: Answer all the questions and each one carries eight marks.**

5. Read the following paragraph and make notes first and then its summary. **(CO3)**

   Astronauts are people who travel on space ships. They need to have a very clean home. They travel far from Earth. We need clean kitchens everywhere on earth and in space. Astronauts have to solve two problems: how to get food and how to keep their spaceship clean. Here is how they solved the food problem. At first, the astronauts took tubes of food with them into space. They would squeeze a tube and eat semi-liquid food. It did not taste great, but since they did not need to take dishes or silverware with them, they had no dishes to wash. Today's spaceships have a bigger menu. Astronauts can eat from bowls. In fact, they take cereal and other standard foods with them. The foods are packaged in special containers to keep them fresh. They use knives, forks, and spoons. One unusual item on their table is a pair of scissors. They use the scissors to open the food packages. They can eat right from the package. They have a kitchen on the spaceship. Its oven can heat food to 170 degrees. The kitchen has water and

sets of meals that come on trays. The astronauts choose their menu before they go into space. They take a lot of food with them. The astronauts keep bread and fresh fruits and vegetables in a special food locker. How do they keep the kitchen clean? They do not have to worry about mice or other rodents. They make sure that there are no rodents before the ship leaves. But sometimes mice travel on the ship. Those mice are part of experiments. They live in cages. How do astronauts keep their trays clean? That is another health problem the astronauts solve. They need to stay healthy in space. To carry a lot of water to wash trays would be a lot of extra weight. They pack wet wipes in plastic bags. They use them to clean trays. So, their kitchen is clean and they stay healthy.

6. Write an essay in about 120 words on the importance of goal setting and your short and long term goals. **(CO3,CO4)**
7. Write a report about the bush fire that raged in Australia recently by using the following clues: forest, natural disaster, wild fire, dried leaves, no rain fall, wild animals, burnt alive, loss of flora and fauna, fire fighters, uncontrollable, moderate rains, environmental pollution, measures to protect...etc. **(CO3)**

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**STATE BOARD OF TECHNICAL EDUCATION- A.P**

**Model Question Paper**

**C20-C-101- ENGLISH**

**Time: 3hrs** **Max.Marks:80**

**PART-A** **10X3=30 Marks**

**Instructions: Answer all the questions. Each question carries Three marks.**

1. a) Fill in the blanks with suitable articles **(CO2)**
   I have seen _____ European at _____local market.
   b) Fill in with proper form of adjective given in the bracket: **(CO2)**
   China is the _____country in the world. ( populous, more populous, most populous )
   c) i) Choose the synonym from the following for the word : 'filthy' **(CO3)**
   dirty / clean / hygienic / tidy
   ii) Choose the antonym from the following for the word: 'exterior' **(CO3)**
   external / internal / open / interior
2. a) i) Give prefix for the word: 'popular' **(CO2)**
   ii) Write suffix for the word : 'king' **(CO2)**
   b) He was married _____ her _____ January 2015. ( Fill in with appropriate preposition) **(CO3)**
   c) Match the words in column A with their corresponding meanings in column B: **(CO2)**

| **Column-A** | **Column-B** |
|---|---|
| i) Dynamic | a) tasty |
| ii) Gloomy | b) active |
| | c) sad |
| | d) proud |

3. a) The old man *hunted* for his spectacles. ( Give the contextual meaning of the word in italics) **(CO3)**
   b) The committee / have submitted / its report / to the President. ( identify the part which contains an error ) **(CO3)**
   c) Recently has a scooter purchased Shanthi. ( Rearrange the jumbled words to make a meaningfulsentence.) **(CO3)**
4. a) Use the following primary auxiliary verb in sentence of your own: **(CO2)**
   ' does'
   b) Fill in the blank with proper modal auxiliary verb based on the clue in the bracket**(CO2)**
   Harish _____ speak four languages. ( ability)
   c) Rakesh wants two hundred rupees from his father. (Write the sentence how he requests his Father) **(CO2)**
5. Fill in the blanks with suitable form of the verb given in brackets: **(CO2)**
   a) He _____ (go) for a walk daily.
   b) The bus _____ (arrive) just now.
   c) We _____ (live) in Chennai since 2005.

6. Hange the voice of the following sentences: **(CO2)**
   a) English is spoken all over the world.
   b) They watched a movie yesterday.
   c) The Chief Minister will inaugurate the exhibition.
7. a) It is a beautiful rainbow. ( Change into an exclamatory sentence) **(CO3)**
   b) C.V. Raman won the Nobel Prize in 1930. ( Frame a question using 'When') **(CO3)**
   c) He can swim across the river. ( change into 'Yes / No' question ) **(CO3)**
8. Change the speech of the following: **(CO2)**
   a) He said, "I will go to Delhi tomorrow."
   b) Ravi said to Ashok, " Where are you going?"
   c) She told him to mind his own business.
9. Rewrite as directed: **(CO2)**
   a) In spite of being busy he attended the meeting. ( Rewrite the sentence using 'though' )
   b) She is poor. She is honest. ( combine the two sentences using 'but')
   c) On seeing the tiger, he climbed a tree. ( split into two simple sentences)
10. Rewrite the following sentences after making necessary corrections: **(CO2)**
    a) We have gone to picnic yesterday.
    b) Suresh watched T.V when I went to his house.
    c) They left Gujarat before the earthquake occurred.

**PART-B** **5X8=40**

**Instructions: Answer the following questions. Each question carries EIGHT marks.**

11. Write a paragraph in about 100 words on what you do daily. **(CO3,CO4)**

OR

Write a paragraph in about 100 words on the uses and misuses of social media.

12. Construct a dialogue of at least five turns between an American and you about places worth visiting in your city. **(CO3,CO4)**

OR

Compose a dialogue of at least five turns between two friends, one favouring homemade food and the other, fast foods.

13. Write a letter to your parents about your preparation for year-end examinations. **(CO3,CO4)**

OR

Write a letter to the editor of a newspaper about the inconvenience caused due to loud speakers in your area.

14. Write an essay in about 120 words on measures to prevent water pollution.

OR

Write an essay in about 120 words on importance of gender equality.

15. Read the following passage and answer the questions that follow: **(CO3)**

A farmer in ancient China had a neighbour who was a hunter, and who owned ferocious and poorly trained hunting dogs. They jumped over the fence frequently and chased the farmer's lambs. The farmer asked his neighbour to keep his dogs in check, but this fell on deaf ears. One day the dogs again jumped the fence, attacked and severely injured several of the lambs.

The farmer had had enough, and went to town to consult a judge who listened carefully to the story and said: "I could punish the hunter and instruct him to keep his dogs chained or lock them up. But you would lose a friend and gain an enemy. Which would you rather have, friend or foe for a neighbour?" The farmer replied that he preferred a friend. “Alright, I will offer you a solution that keeps your lambs safe, and which will keep your a neighbour a friend." Having heard the judge's solution, the farmer agreed.

Once at home, the farmer immediately put the judge's suggestions to the test. He took three of his best lambs and presented them to his neighbour's three small sons, who were beside themselves with joy and began to play with them. To protect his son's newly acquired playthings, the hunter built a strong kennel for his dogs. Since then, the dogs never again bothered the farmer's lambs. Out of gratitude for the farmer's generosity toward his sons, the hunter often shared the game he had hunted with the farmer. The farmer reciprocated by sending the hunter the cheese he had made. Within a short time the neighbours became good friends.

a) What kind of dogs does the neighbour have?
b) When did the farmer consult the judge?
c) What would be the consequence if the judge punished the neighbour?
d) What was the solution suggested by the judge?
e) What did the neighbour’s sons do with the gifts they received?
f) How did the dogs stop bothering the farmer’s lambs?
g) What items are exchanged happily between the two neighbours?
h) Pick the word from the passage that would mean: ‘a closed shelter for dogs’.

**OR**

Read the following short poem and answer the questions that follow:

Crisp in the winter’s morning,
Softly all through the night,
What is this without warning,
Falling and white?

I have never seen snow,
But I can imagine it quite –
Not how it tastes, but I know,
It falls and is white.

One morning I’ll open the door,
To bring in the morning’s milk,
And all around there’ll be snow –
Fallen and still.

How I'll roll in the stuff!
How I'll tumble and spin!
Until the neighbours cry,
Enough!And send me back in.

Q. 1. What is the poem about?
2. How does snow fall?
3. Did you ever touch snow? How did you feel?
4. a) Pick the word from the poem that means 'slip and fall'
b) Write the antonym for the word 'soft'

**SECTION – C 1X10=10 Marks**

16. Write a report on the blood donation camp organized by International Red Cross Society in your college. Use the following clues: date, time, place, arrangements, donors, equipment, doctors, response, sponsors, snacks, volunteers, help others, save lives…etc.

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| Course Code | Course Title | No. of Periods/week | Total No. of periods | Marks for FA | Marks for SA |
|---|---|---|---|---|---|
| C-102 | Engineering Mathematics-I | 5 | 150 | 20 | 80 |

| S.No. | Unit Title | No. of periods | COs mapped |
|---|---|---|---|
| 1 | Algebra | 31 | CO1 |
| 2 | Trigonometry | 44 | CO2 |
| 3 | Co-ordinate Geometry | 23 | CO3 |
| 4 | Differential Calculus | 33 | CO4 |
| 5 | Applications of Differentiation | 19 | CO4, CO5 |
| | **Total Periods** | **150** | |

| | |
|---|---|
| **Course Objectives** | (i) To apply the principles of Algebra, Trigonometry and Co-Ordinate Geometry to real-time problems in engineering.<br>(ii) To comprehend and apply the concept of Differential Calculus in engineering applications. |

| | | |
|---|---|---|
| **Course Outcomes** | CO1 | Identify various functions, resolve partial fractions and solve problems on matrices. |
| | CO2 | Solve problems using the concept of trigonometric functions, their inverses and complex numbers. |
| | CO3 | Find the equations and properties of straight lines, circles and conic sections in coordinate system. |
| | CO4 | Evaluate the limits and derivatives of various functions. |
| | CO5 | Evaluate solutions for engineering problems using differentiation. |

**ENGINEERING MATHEMATICS – I**

**COMMON TO ALL BRANCHES**

**Learning Outcomes**

**UNIT - I**

**C.O. 1 Identify various functions, resolve partial fractions and solve problems on matrices.**

**L.O.** 1.1 Define Set, ordered pairs and Cartesian product - examples.

1.2 Explain Relations and functions – examples

1.3 Find Domain & Range of functions – simple examples.

1.4 Classify types of functions (into, many-to-one, one-one, onto and bijective).

1.5 Define inverse functions - examples.

1.6 Define rational, proper and improper fractions of polynomials.

1.7 Explain the procedure of resolving rational fractions of the type mentioned below into partial fractions

$i)\quad \dfrac{f(x)}{(ax+b)(cx+d)}$ $ii)\quad \dfrac{f(x)}{(ax+b)^2(cx+d)}$

$iii)\quad \dfrac{f(x)}{(x^2+a^2)(bx+c)}$ $iv)\quad \dfrac{f(x)}{(x^2+a^2)(x^2+b^2)}$

1.8 Define a matrix and order of a matrix.

1.9 State various types of matrices with examples (emphasis on 3rd order square matrices).

1.10 Compute sum, scalar multiplication and product of matrices. Illustrate the properties of these operations such as associative, distributive, commutative properties with examples and counter examples.

1.11 Define the transpose of a matrix and write its properties;

1.12 Define symmetric and skew-symmetric matrices with examples Resolve a square matrix into a sum of a symmetric and skew- symmetric matrices and provide examples.

1.13 Define determinant of a square matrix, minor, co-factor of an element of a 3x3 square matrix with examples. Expand the determinant of a 3 x 3 matrix using Laplace expansion formula. State and apply the properties of determinants to solve problems.

1.14 Distinguish singular and non-singular matrices. Define multiplicative inverse of a matrix and list properties of adjoint and inverse. Compute adjoint and multiplicative inverse of a square matrix.

1.15 Solve system of 3 linear equations in 3 unknowns using Cramer's rule and matrix inversion method.

## UNIT - II

**C.O.2 Solve problems using the concept of trigonometric functions, their inverses and complex numbers.**

**L.O.** 2.1 Define trigonometric ratios of any angle.

2.2 List the values of trigonometric ratios at specified values.

2.3 Draw graphs of trigonometric functions.

2.4 Explain periodicity of trigonometric functions.

2.5 Define compound angles and state the formulae of sin(A±B), cos(A±B), tan(A±B) and cot(A±B).

2.6 Give simple examples on compound angles to derive the values of $\sin 15^0$, $\cos 15^0$, $\sin 75^0$, $\cos 75^0$, $\tan 15^0$, $\tan 75^0$ etc.

2.7 Derive identities like $\sin(A+B)\sin(A-B) = \sin^2 A - \sin^2 B$ etc.

2.8 Solve simple problems on compound angles.

2.9 Derive the formulae of multiple angles 2A, 3A etc and sub multiple angles A/2 in terms of angle A of trigonometric functions.

2.10 Derive useful allied formulas like $\sin^2 A = (1 - \cos 2A)/2$ etc.

2.11 Solve simple problems using the above formulae

Syllabus for Unit test-I completed

2.12 Derive the formulae on transforming sum or difference of two trigonometric ratios into a product and vice versa, examples on these formulae.

2.13 Solve problems by applying these formulae to sum or difference or product of three or more terms.

2.14 Explain the concept of the inverse of a trigonometric function by selecting an appropriate domain and range.

2.15 Define inverses of six trigonometric functions along with their domains and ranges.

2.16 Derive relations between inverse trigonometric functions so that given $A = \sin^{-1}x$, express angle A in terms of other inverse trigonometric functionswith examples.

2.17 State various properties of inverse trigonometric functions and identities like

$\sin^{-1}x + \cos^{-1}x = \frac{\pi}{2}$ etc.

2.18 Apply formulae like $\tan^{-1}x + \tan^{-1}y = \tan^{-1}\left(\frac{x+y}{1-xy}\right)$, *where* $x \geq 0, y \geq 0, xy < 1$ etc., to solve Simple problems.

2.19 Explain what is meant by solutions of trigonometric equations and find the general solutions of $\sin x = k$, $\cos x = k$ and $\tan x = k$ with appropriate examples.

2.20 Solve models of the type $a\sin^2 x + b\sin x + c = 0$, $a\cos x + b\sin x = c$ etc., and problems using simple transformations.

2.21 State sine rule, cosine rule, tangent rule and projection rule.

2.22 Explain the formulae for sin A/2, cos A/2, tan A/2 and cot A/2 in terms of semi-perimeter $s$ and sides a,b,c and solve problems.

2.23 List various formulae for the area of a triangle.

2.24 Solve problems using the above formulae.

2.25 DefineSinh x, cosh x and tanh x and list the hyperbolic identities.

2.26 Represent inverse hyperbolic functions in terms of logarithms.

2.27 Define complex number, its modulus , conjugate and list their properties.

2.28 Define the operations on complex numbers with examples.

2.29 Define amplitude of a complex number.

2.30 Represent the complex number in various forms like modulus-amplitude (polar) form, Exponential (Euler) form with examples.

2.31 WriteDeMoivre's theorem (without proof) and illustrate with simple examples.

**UNIT - III**

**Coordinate Geometry**

**C.O. 3 Find the equations and properties of straight lines, circles and conic sections in coordinate system.**

**L.O.** 3.1 Write the different forms of a straight line – general form, point-slope form, slope-intercept form, two-point form, intercept form and normal form or perpendicular form.

3.2 Solve simple problems on the above forms.

3.3 Find distance of a point from a line, acute angle between two lines, intersection of two non parallel lines and distance between two parallel lines.

3.4 Define locus of a point and define a circle.

3.5 Write the general equation of a circle and find the centre and radius.

3.6 Find the equation of a circle given (i) centre and radius, (ii) two ends of a diameter (iii) Centre and a point on the circumference (iv) three non collinear points.

3.7. Define a conic section.

3.8 Explain the terms focus, directrix, eccentricity, axes and latus rectum of a conic with illustrations.

3.9 Find the equation of a conic when focus, directrix and eccentricity are given.

3.10 Describe the properties of Parabola, Ellipse and Hyperbola in standard forms whose axes are along co-ordinate axes and solve simple examples on above.

Syllabus for Unit test-II completed

**C.O.4 Evaluate the limits and derivatives of various functions.**

L.O. 4.1 Explain the concept of limit and meaning of $\lim_{x\to a} f(x)=l$ and state the properties of limits.

4.2 Evaluate the limits of the type $\lim_{x\to l}\frac{f(x)}{g(x)}$ and $\lim_{x\to\infty}\frac{f(x)}{g(x)}$

4.3 Mention the Standard limits $\lim_{x\to a}\frac{x^n-a^n}{x-a}$, $\lim_{x\to 0}\frac{\sin x}{x}$, $\lim_{x\to 0}\frac{\tan x}{x}$, $\lim_{x\to 0}\frac{a^x-1}{x}$, $\lim_{x\to 0}\frac{e^x-1}{x}$, $\lim_{x\to 0}(1+x)^{\frac{1}{x}}$, $\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^x$ (without proof) and solve the problems using these standard limits.

4.4 Explain the concept of continuity of a function at a point and on an interval with some examples whether a given function is continuous or not.

4.5 State the concept of derivative of a function y = f(x) – definition, first principle as $\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ and also provide standard notations to denote the derivative of a function.

4.6 State the significance of derivative in scientific and engineering applications.

4.7 Find the derivatives of elementary functions like $x^n$ , $a^x$, $e^x$, log x, sin x, cos x, tanx, Secx,Cosecx and Cot x using the first principles.
4.8 Find the derivatives of simple functions from the first principle .
4.9 State the rules of differentiation of sum, difference, scalar multiplication, product and quotient of functions with illustrative and simple examples.
4.10 Explain the method of differentiation of a function of a function (Chain rule) with illustrative examples.
4.11 Find the derivatives of Inverse Trigonometric functions and examples using the Trigonometric transformations.
4.12 Explain the method of differentiation of a function with respect to another functionand also differentiation of parametric functions with examples.
4.13 Find the derivatives of hyperbolic functions.
4.14 Explain the procedures for finding the derivatives of implicit function withexamples.
4.15 Explain the need of taking logarithms for differentiating some functions with examples like $[f(x)]^{g(x)}$.
4.16 Explain the concept of finding the higher order derivatives of second and third order with examples.
4.17 Explain the concept of functions of several variables, partial derivatives anddifference between the ordinary and partial derivatives with simple examples.
4.18 Explain the definition of Homogenous function of degree n.
4.19 Explain Euler's theorem for homogeneous functions with applications to simple problems.

**C.O. 5 Evaluate solutions for engineering problems using differentiation.**

**L.O.** 5.1 State the geometrical meaning of the derivative as the slope of the tangent to the curve y=f(x) at any point on the curve.
5.2 Explain the concept of derivative to find the slope of tangent and to find the equation of tangent and normal to the curve y=f(x) at any point on it.
5.3 Find the lengths of tangent, normal, sub-tangent and sub normal at any point on the curve y=f(x) .
5.4 Explain the derivative as a rate of change in distance-time relations to find the velocity and acceleration of a moving particle with examples.
5.5 Explain the derivative as a rate measurer in the problems where the quantities like volumes, areas vary with respect to time- illustrative examples.
5.6 Define the concept of increasing and decreasing functions.
5.7 Explain the conditions to find points where the given function is increasing or decreasing with illustrative examples.
5.8 Explain the procedure to find the extreme values (maxima or minima) of a function of single variable- simple problems yielding maxima and minima.
5.9 Solve problems on maxima and minima in applications like finding areas, volumes etc.
5.10 Apply the concept of derivatives to find the errors and approximations in simple problems.

Syllabus for Unit test-III completed

## CO/PO – Mapping

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 2 | | | | 3 | 2 | 3 |
| CO2 | 3 | 3 | 3 | 2 | | | | 3 | 3 | 1 |
| CO3 | 3 | 2 | 2 | 1 | | | | 3 | 2 | 2 |
| CO4 | 3 | 3 | 2 | 2 | | | | 3 | 2 | 1 |
| CO5 | 3 | 3 | 3 | 3 | | | | 3 | 3 | 3 |
| **Avg** | 3 | 2.6 | 2.5 | 2 | | | | 3 | 2.4 | 2 |

**3 =** Strongly mapped (High), **2 =**moderately mapped (Medium), **1 =**slightly mapped (Low)

**Note**:

**PO5:** Appropriate quiz programme may be conducted at intervals and duration as decided by concerned teacher.

**PO6:** Seminars on applications of mathematics in various engineering disciplines are to be planned and conducted.

**PO7:** Such activities are to be planned that students visit library to refer standard books on Mathematics and latest updates in reputed national and international journals, attending seminars, learning mathematical software tools.

**PSO1:** An ability to understand the concepts of basic mathematical concepts and to apply them in various areas like computer programming, civil constructions, fluid dynamics, electrical and electronic systems and all concerned engineering disciplines.

**PSO2:** An ability to solve the Engineering problems using latest software tool, along with analytical skills to arrive at faster and appropriate solutions.

**PSO3:** Wisdom of social and environmental awareness along with ethical responsibility to have a successful career as an engineer and to sustain passion and zeal for real world technological applications.

**PO- CO – Mapping strength**

| PO no | Mapped with CO no | CO periods addressing PO in column I | | Level (1,2 or 3) | Remarks |
|---|---|---|---|---|---|
| | | No | % | | |
| 1 | CO1, CO2, CO3,CO4,CO5 | 150 | 100% | 3 | >40% Level 3 Highly addressed |
| 2 | CO1, CO2, CO3,CO4,CO5 | 138 | 92% | 3 | |
| 3 | CO1, CO2, CO3,CO4,CO5 | 133 | 88.6% | 3 | |
| 4 | CO1, CO2, CO3,CO4,CO5 | 120 | 80% | 3 | 25% to 40% Level 2 Moderately addressed |
| PSO 1 | CO1, CO2, CO3,CO4,CO5 | 150 | 100% | 3 | |
| PSO 2 | CO1, CO2, CO3,CO4,CO5 | 135 | 90% | 3 | 5% to 25% Level 1 Low addressed |
| PSO 3 | CO1, CO2, CO3,CO4,CO5 | 125 | 83.3% | 3 | <5% Not addressed |

**COMMON TO ALL BRANCHES**

**COURSE CONTENT**

**Unit-I**

**Algebra**

1. **Relations and Functions**:

   Define Set, Ordered pairs, Cartesian product, Relations, functions, domain & range of functions. Describe types of functions (in-to, many-to-one, one-one, onto and bijective) and inverse functions – examples.

2. **Partial Fractions:**

   Define rational, proper and improper fractions of polynomials. Resolve rational fractions in to their partial fractions covering the types mentioned below.

   $i)\quad \dfrac{f(x)}{(ax+b)(cx+d)}$ $\qquad ii)\quad \dfrac{f(x)}{(ax+b)^2(cx+d)}$

   $iii)\quad \dfrac{f(x)}{(x^2+a^2)(bx+c)}$ $\qquad iv)\quad \dfrac{f(x)}{(x^2+a^2)(x^2+b^2)}$

3. **Matrices:**
   Definition of a matrix, types of matrices-examples, algebra of matrices-equality of two matrices, sum, scalar multiplication and product of matrices. Transpose of a matrix-Symmetric, skew symmetric matrices-Minor, cofactor of an element-Determinant of a square matrix-Laplace's expansion, properties of determinants. Singular and non-singular matrices-Adjoint and multiplicative inverse of a square matrix- examples-System of linear equations in 3 variables-Solutions by Cramers's rule and Matrix inversion method-examples.

**Unit-II**

**Trigonometry**

4. **Trigonometric ratios:**
   Definition of trigonometric ratios of any angle, values of trigonometric ratios at specified values, draw graphs of trigonometric functions, periodicity of trigonometric functions.
5. **Compound angles:**
   Formulas of sin(A±B), cos(A±B), tan(A±B),cot(A±B),and related identities with problems.
6. **Multiple and sub multiple angles:**
   Formulae for trigonometric ratios of multiple angles 2A, 3A and sub multipleangles A/2 with problems.
7. Transformations of products into sums or differences and vice versa simple problems
8. **Inverse trigonometric functions:**
   Definition, domains and ranges-basic properties- problems.

9. **Trigonometric equations:**
   Concept of a solution, principal value and general solution of trigonometric equations: sinx =k ,cosx= k, tanx =k, where k is a constant. Solutions of simple quadratic equations, equations involving usage of transformations- problems.
10. **Properties of triangles:**
    Relation between sides and angles of a triangle- sine rule, cosine rule, tangent rule and projection rule-area of a triangle- problems.
11. **Hyperbolic functions:**
    Definitions of hyperbolic functions, identities of hyperbolic functions, inverse hyperbolic functions and expression of inverse hyperbolic functions in terms of logarithms.
12. **Complex Numbers:**
    Definition of a complex number, Modulus and conjugate of a complex number, Arithmetic operations on complex numbers, Modulus- Amplitue (polar) form , Exponential form (Euler form) of a complex number- Problems. DeMoivre's theorem.

**UNIT-III**
**Coordinate geometry**

13 **Straight lines:** various forms of straight lines, angle between lines, perpendicular distance from a point, distance between parallel lines-examples.

14. **Circle:** locus of a point, Circle, definition-Circle equation given (i) centre and radius, (ii) two ends of a diameter (iii) centre and a point on the circumference (iv) three non collinear points - general equation of a circle – finding centre, radius.
15. Definition of a conic section, equation of a conic when focus directrix and eccentricity are given. properties of parabola, ellipse and hyperbola in standard forms.

**UNIT-IV**
**Differential Calculus:**

16. **Concept of Limit-** Definition- Properties of Limits and Standard Limits -Simple Problems- Continuity of a function at a point- Simple Examples only.

17. **Concept of derivative-** Definition (first principle)- different notations-derivatives of elementary functions- problems. Derivatives of sum, product, quotient, scalar multiplication of functions - problems. Chain rule, derivatives of inverse trigonometric functions, derivative of a function with respect to another function, derivative of parametric functions, derivative of hyperbolic, implicit functions, logarithmic differentiation – problems in each case. Higher order derivatives - examples – functions of several variables - partial differentiation, Euler's theorem-simple problems.

**UNIT-V**
**Applications of Derivatives:**

18. Geometrical meaning of the derivative, equations of Tangent and normal to a curve at any point. Lengths of tangent, normal, sub tangent and subnormal to the curve at any point - problems.
19. Physical applications of the derivative – velocity, acceleration, derivative as a rate measure –Problems.

**20**. Applications of the derivative to find the extreme values – Increasing and decreasing functions, finding the maxima and minima of simple functions - problems leading to applications of maxima and minima.

**21**. Using the concept of derivative of a function of single variable, find the absolute error, relative and percentage errors and approximate values due to errors in measuring.

**Textbook:**

Engineering Mathematics-I, a textbook for first year diploma courses, prepared & prescribed by SBTET, AP.

**Reference Books:**


1. Shanti Narayan, A Textbook of matrices, S.Chand&Co.
2. Robert E. Moyer & Frank Ayers Jr., Schaum's Outline of Trigonometry, 4th Edition, Schaum's Series
3. M.Vygodsky, Mathematical Handbook, Mir Publishers, Moscow.
4. Frank Ayers & Elliott Mendelson, Schaum's Outline of Calculus, Schaum's Series


**Engineering Mathematics – I**
**Blue print**

| S. No | Chapter/ Unit title | No of Periods | | Weightage Allotted | Marks wise distribution of weightage | | | | Question wise distribution of weightage | | | | COs mapped |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Unit - I : Algebra** | **Theory** | **Practice** | | **R** | **U** | **Ap** | **An** | **R** | **U** | **Ap** | **An** | |
| **1** | Relations and Functions | 4 | 2 | 3 | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 0 | **CO 1** |
| **2** | Partial Fractions | 3 | 2 | 3 | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 0 | **CO 1** |
| **3** | Matrices and Determinants | 10 | 10 | 11 | 3 | 0 | 8 | 0 | 1 | 0 | 1 | 0 | **CO 1** |
| | **Unit - II : Trigonometry** | | | | | | | | | | | | |
| **4** | Trigonometric Ratios | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **CO2** |
| **5** | Compound Angles | 3 | 2 | 3 | 3 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **CO2** |
| **6** | Multiple and Submultiple angles | 4 | 4 | 3 | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 0 | **CO2** |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **7** | Transformations | 3 | 3 | 8 | 0 | 8 | 0 | 0 | 0 | 1 | 0 | 0 | **CO2** |
| **8** | Inverse Trigonometric Functions | 3 | 2 | | | | | | | | | | |
| **9** | Trigonometric Equations | 3 | 2 | 8 | 0 | 0 | 8 | 0 | 0 | 0 | 1 | 0 | **CO2** |
| **10** | Properties of triangles | 3 | 2 | | | | | | | | | | |
| **11** | Hyperbolic Functions | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **CO2** |
| **12** | Complex Numbers | 4 | 2 | 3 | 3 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **CO2** |
| | **Unit III : Co-ordinate Geometry** | | | | | | | | | | | | |
| **13** | Straight Lines | 4 | 2 | 3 | 3 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **CO3** |
| **14** | Circle | 3 | 2 | 8 | 0 | 8 | 0 | 0 | 0 | 1 | 0 | 0 | **CO3** |
| **15** | Conic Sections | 8 | 4 | | | | | | | | | | |
| | **Unit – IV : Differential Calculus** | | | | | | | | | | | | |
| **16** | Limits and Continuity | 4 | 2 | 3 | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 0 | **CO4** |
| **17** | Differentiation | 17 | 10 | 14 | 3 | 11 | 0 | 0 | 1 | 2 | 0 | 0 | **CO4** |
| | **Unit - V : Applications of Differentiation** | | | | | | | | | | | | |
| **18** | Geometrical Applications | 3 | 2 | 10 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 1 | **CO5** |
| **19** | Physical Applications | 2 | 2 | | | | | | | | | | |
| **20** | Maxima and Minima | 3 | 4 | | | | | | | | | | |
| **21** | Errors and Approximations | 2 | 1 | | | | | | | | | | |
| **Total** | | **89** | **61** | **80** | **15** | **39** | **16** | **10** | **5** | **8** | **2** | **1** | |

**R: Remembering Type : 15 Marks**
**U: understanding Type : 39 Marks**
**Ap: Application Type : 16 Marks**
**An: Analysing Type : 10 Marks**

## Engineering Mathematics – I
## Unit Test Syllabus

| Unit Test | Syllabus |
|---|---|
| **Unit Test-I** | From L.O. 1.1 to L.O. 2.11 |
| **Unit Test-II** | From L.O. 2.12 to L.O. 3.10 |
| **Unit Test-III** | From L.O.4.1 to L.O. 5.10 |

**Unit Test I** **C –20, C -102**

**State Board of Technical Education and Training, A. P**

**First Year**

**Subject name: Engineering Mathematics-I**

**Sub Code: C-102**

**Time : 90 minutes** **Max.marks:40**

**Part-A** **16Marks**

***Instructions:*** **(1) Answer all questions.**

**(2) First question carries four marks and the remaining questions carry three marks each.**

1. Answer the following.

   a. If $f(x)=x^2$ and domain $=\{-1,0,1\}$, then find range. (CO1)

   b. If $A=\begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix}$, then find 3A. (CO1)

   c. Write the value of $Sin120^0$ (CO2)

   d. Write the formula for $\tan 2A$ in terms of $\tan A$ (CO2)

2. If $f:R\to R$ is defined by $f(x)=3x-5$, then prove that $f(x)$ is onto. (CO1)

3. If $A=\begin{bmatrix}1 & 3\\ 4 & -9\end{bmatrix}$, $B=\begin{bmatrix}2 & 4\\ -3 & 1\end{bmatrix}$ then find $2A+3B$ (CO1)

4. Prove that $Sin^2 45^0 - Sin^2 15^0 = \frac{\sqrt{3}}{4}$ (CO2)

5. Prove that $\frac{\sin 2A}{1-\cos 2A}=\cot A$ (CO2)

**Part-B** **3×8=24**

***Instructions:*** **(1) Answer all questions.**

**(2) Each question carries eight marks**

**(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. A) Resolve $\frac{2x}{(x-1)(x-3)}$ into partial fractions. (CO1)

   or

   B) Resolve $\frac{x+4}{x^2-3x+2}$ into partial fractions. (CO1)

7. A) Using Cramer's rule to solve

$x-y+z=2, 2x+3y-4z=-4, 3x+y+z=8$ (CO1)

or

B) Prove that $\begin{vmatrix} bc & b+c & 1 \\ ca & c+a & 1 \\ ab & a+b & 1 \end{vmatrix} = (a-b)(b-c)(c-a)$ (CO1)

8. A) Find the adjoint of Matrix $\begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 5 \\ 2 & 7 & -4 \end{bmatrix}$ (CO1)

or

B) If $A = \begin{bmatrix} 2 & 3 & 4 \\ 5 & 7 & 9 \\ -2 & 1 & 3 \end{bmatrix}$; $B = \begin{bmatrix} 3 & 1 & -5 \\ 2 & 1 & 4 \\ 0 & 3 & 1 \end{bmatrix}$, find AB and BA and verify if $AB = BA$.

(CO1)

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**Unit Test II** **C –20, C -102**

**State Board of Technical Education and Training, A. P**

**First Year**

**Subject name: Engineering Mathematics-I**

**Sub Code: C- 102**

**Time : 90 minutes** **Max.marks:40**

**Part-A** **16Marks**

***Instructions:*** **(1) Answer all questions.**
**(2) First question carries four marks and the remaining questions carry three marks each**

1. Answer the following.

   a. $\sin C + \sin D = 2\cos\left(\frac{C+D}{2}\right)\sin\left(\frac{C-D}{2}\right)$ : State TRUE/FALSE (CO2)

   b. If $z = 2+3i$, then find $|z|$ (CO2)

   c. $\sinh x = \frac{e^x - e^{-x}}{2}$ : State TRUE/FALSE (CO2)

   d. Write the eccentricity of rectangular hyperbola. (CO3)

2. Express $(3-4i)(7+2i)$ in terms of $a+ib$ (CO2)

3. Find the perpendicular distance from $(1,1)$ to the line $2x+3y-1=0$ (CO3)

4. Find the angle between lines $2x-y+3=0$ and $x+y-2=0$ (CO3)

5. Find the centre and radius of the circle $x^2+y^2-2x+4y-4=0$ (CO3)

**Part-B** **3×8=24**

***Instructions:*** **(1) Answer all questions.**
**(2) Each question carries eight marks**
**(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. A) Prove that $\frac{\sin 2\theta + \sin 4\theta + \sin 6\theta}{\cos 2\theta + \cos 4\theta + \cos 6\theta} = \tan 4\theta$. (CO2)

   or

   B) Prove that $\tan^{-1}\frac{1}{2} + \tan^{-1}\frac{1}{5} + \tan^{-1}\frac{1}{8} = \frac{\pi}{4}$ (CO2)

7. A) Solve $2\sin^2\theta - \sin\theta - 1 = 0$ (CO2)

or

B) In any $\Delta ABC$, If $\angle B = 60^0$ then $\frac{c}{a+b} + \frac{a}{b+c} = 1$ (CO2)

8. A) Find the equation of circle with $(2,3)$ and $(6,9)$ as the end points of diameter and also find centre and radius of circle. (CO3)

or

B) Find the equation of ellipse whose focus is $(1,-1)$, directrix is $x - y + 3 = 0$ and eccentricity is1/2. (CO3)

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**Unit Test III** **C –20, C -102**

**State Board of Technical Education and Training, A. P**

**First Year**

**Subject name: Engineering Mathematics-I**

**Sub Code: C-102**

**Time : 90 minutes** **Max.Marks:40**

**Part-A** **16Marks**

***Instructions:*** **(1) Answer all questions.**

**(2) First question carries four marks and the remaining questions carry three marks each**

1. Answer the following.

   a. Find $\lim_{x\to 1}\frac{x^2+1}{x+5}$ (CO4)

   b. $\lim_{\theta\to 0}\frac{\sin 2\theta}{\theta}=2$ : State TRUE/FALSE (CO4)

   c. $\frac{d}{dx}\left(3\tan^{-1}x\right)=?$ (CO4)

   d. Formula for percentage error in $x$ is _____ (CO5)

2. Evaluate $\lim_{x\to 2}\frac{x^5-32}{x^2-4}$ (CO4)

3. Find the derivative of $3\tan x-4\log x+7^x$ w.r.t. x (CO4)

4. Differentiate $x^2\sin x$ w.r.t. $x$ (CO4)

5. Find the derivative of $\frac{2x+3}{3x+4}$ (CO4)

**Part-B** **3×8=24**

***Instructions:*** **(1) Answer all questions.**
**(2) Each question carries eight marks**
**(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. A) Find the derivative of $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$ w.r.t. $\tan^{-1}\left(\frac{2x}{1-x^2}\right)$. (CO4)

or

B) Find $\frac{dy}{dx}$ if $y = x^{\cos x}$ (CO4)

7. A) Verify Euler's theorem when $u(x, y) = \frac{x^4 + y^4}{x - y}$ (CO4)

or

B) Find the equation of tangent and normal to the curve $3y = x^2 - 6x + 17$ at $(4,3)$ (CO5)

8. A) Circular patch of oil spreads on water and the area is growing at the rate of $8\,sqcm/\min$. How fast is the radius increasing when radius is $5\,cm$. (CO5)

or

B) Find the maxima and minima values of $f(x) = x^3 - 6x^2 + 9x + 15.$ (CO5)

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**END-EXAM MODEL PAPERS**

**STATE BOARD OF TECHNICAL EDUCATION, A.P**

**ENGINEERING MATHEMATICS C- 102**

**TIME : 3 HOURS** **MODEL PAPER- I** **MAX.MARKS : 80M**

**PART-A**

**Answer All questions. Each question carries THREE marks.** **10x3=30M**

1. If $A=\left\{0,\frac{\pi}{6},\frac{\pi}{4},\frac{\pi}{3},\frac{\pi}{2}\right\}$ and $f:A\to B$ is a function such that $f(x)=\cos x,$ then find the range of $f$. **CO1**

2. Resolve the function $\frac{x}{(x-1)(x-2)}$ into partial fractions. **CO1**

3. If $\mathrm{A}=\begin{bmatrix}3 & 9 & 0\\ 1 & 8 & -2\end{bmatrix}$ and $\mathrm{B}=\begin{bmatrix}4 & 0 & 2\\ 7 & 1 & 4\end{bmatrix}$, find $\mathrm{A}+\mathrm{B}$ and $\mathrm{A}-\mathrm{B}$. **CO1**

4. Show that $\frac{\cos 16^0+\sin 16^0}{\cos 16^0-\sin 16^0}=\tan 61^0.$ **CO2**

5. Prove that $\frac{\sin 2\theta}{1-\cos 2\theta}=\cot\theta.$ **CO2**

6. Find the modulus of the complex number $\left(\frac{1-i}{2+i}\right)$. **CO2**

7. Find the distance between parallel lines $x+2y+3=0$ and $x+2y+8=0.$ **CO3**

8. Find $\lim_{x\to 0}\frac{\sin 77x}{\sin 11x}.$ **CO4**

9. Differentiate $3\tan x-4\log x-7x^2$ w.r.t. $x$. **CO4**

10. If $x=at^2, y=2at,$ then find $\frac{dy}{dx}.$ **CO4**

**PART-B**

**Answer All questions. Each question carries EIGHT marks.** **5x8=40M**

11 A) Find the inverse of the matrix $\begin{bmatrix}3 & -3 & 4\\ 2 & -3 & 4\\ 0 & -1 & 1\end{bmatrix}$. **CO1**

Or

B) Solve the system of equations $x+y+z=6, x-y+z=2$ and $2x-y+3z=9$ by Cramer's rule. **CO1**

12 A) If $\cos x+\cos y=\frac{3}{5}$ and $\cos x-\cos y=\frac{2}{7}$, then show that **CO2**

$$21\tan\left(\frac{x-y}{2}\right)+10\cot\left(\frac{x+y}{2}\right)=0.$$

Or

B) If $\tan^{-1}x+\tan^{-1}y+\tan^{-1}z=\pi$ then show that $x+y+z=xyz.$ **CO2**

13 A) Solve $\sqrt{3}\cos\theta-\sin\theta=1.$ **CO2**

Or

B) In any $\Delta ABC,$ Show that $\cot\frac{A}{2}+\cot\frac{B}{2}+\cot\frac{C}{2}=\frac{s^2}{\Delta}.$ **CO2**

14 A) Find the equation of the circle with $(4,2)$ and $(1,5)$ as the two ends of its diameter and also find its centre and radius. **CO3**

Or

B) Find the centre, vertices, equation of axes, lengths of axes, eccentricity, foci, equations of directrices and length of latus rectum of the ellipse

$$4x^2+16y^2=1.$$ **CO3**

15 A) Find the derivative of $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$ w.r.t. $\tan^{-1}\left(\frac{2x}{1-x^2}\right)$ **CO4**

Or

B) If $u=\tan^{-1}\left(\frac{x^3-y^3}{x+y}\right),$ then prove that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=\sin 2u.$ **CO4**

**PART-C**

**Answer the following question. Question carries TEN marks. 1x10=10M**

16. The sum of two numbers is 24. Find them so that the sum of their squares is minimum. **CO5**

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**STATE BOARD OF TECHNICAL EDUCATION, A.P**

**ENGINEERING MATHEMATICS C- 102**

**TIME : 3 HOURS** **MODEL PAPER- II** **MAX.MARKS : 80M**

**PART-A**

**Answer All questions. Each question carries THREE marks.** **10x3=30M**

1. If $f:R\to R$ is a bijective function such that $f(x)=ax+b,$ then find $f^{-1}(x).$ **CO1**

2. Resolve the function $\frac{1}{(x+1)(x-2)}$ into partial fractions. **CO1**

3. If $A=\begin{bmatrix} 0 & -1 & 3 \\ 1 & 0 & 7 \\ -3 & x & 0 \end{bmatrix}$ is a skew-symmetric matrix, find the value of $x.$ **CO1**

4. Find the value of $\sin^2 82\frac{1}{2}^0-\sin^2 22\frac{1}{2}^0$. **CO2**

5. Prove that $\frac{\cos 3A}{2\cos 2A-1}=\cos A.$ **CO2**

6. Find the conjugate of the complex number $(3-2i).(4+7i)$ **CO2**

7. Find the equation of the line passing through the points $(1,2)$ and $(3,-4).$ **CO3**

8. Find $\lim_{x\to 2}\frac{x^5-32}{x-2}.$ **CO4**

9. Differentiate $\sqrt{x}-\sec x+\log x$ w.r.t. $x.$ **CO4**

10. If $u(x,y)=x^3-3axy+y^3,$ then find $\frac{\partial u}{\partial x}$ and $\frac{\partial u}{\partial y}.$ **CO4**

**PART-B**

**Answer All questions. Each question carries EIGHT marks. 5x8=40M**

11 A) Show that $\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix}=(a-b)(b-c)(c-a).$ **CO1**

Or

B) Solve the system of equations $x+2y+3z=6, 3x-2y+4z=5$ and $x-y-z=-1$ using matrix inversion method. **CO1**

12 A) Prove that $\frac{\sin 2\theta+\sin 4\theta+\sin 6\theta}{\cos 2\theta+\cos 4\theta+\cos 6\theta}=\tan 4\theta.$ **CO2**

Or

B) Prove that $\tan^{-1}\frac{1}{3}+\tan^{-1}\frac{1}{5}+\tan^{-1}\frac{1}{7}+\tan^{-1}\frac{1}{8}=\frac{\pi}{4}.$ **CO2**

13 A) Solve $2\cos^2\theta-3\cos\theta+1=0.$ **CO2**

Or

B) In any $\Delta ABC,$ Show that $\sum a^3\cos(B-C)=3abc.$ **CO2**

14 A) Find the equation of the circle passing through the points $(0,0),(6,0)$ and $(0,8).$ **CO3**

Or

B) Find the equation of the rectangular hyperbola whose focus is $(1,2)$ and directrix is $3x+4y-5=0.$ **CO3**

15 A) If $\sin y=x\sin(a+y),$ then prove that $\frac{dy}{dx}=\frac{\sin^2(a+y)}{\sin a}.$ **CO4**

Or

B) If $y=\tan^{-1}x,$ then prove that $(1+x^2)y_2+2xy_1=0.$ **CO4**

**PART-C**

**Answer the following question. Question carries TEN marks.** **1x10=10M**

**16** Show that the semi-vertical angle of the cone of maximum volume and of given slant height is $\tan^{-1}\sqrt{2}.$ **CO4**

***

| Course code | Course Title | No. of Periods per week | Total No. of Periods | Marks for FA | Marks for SA |
|---|---|---|---|---|---|
| C-103 | Engineering Physics | 4 | 120 | 20 | 80 |

| S. No | Unit Title/Chapter | No of Periods | COs Mapped |
|---|---|---|---|
| 1 | Units and Dimensions | 08 | CO1 |
| 2 | Elements of Vectors | 12 | CO1 |
| 3 | Dynamics | 12 | CO2 |
| 4 | Friction | 10 | CO2 |
| 5 | Work, Power and Energy | 12 | CO3 |
| 6 | Simple harmonic motion | 12 | CO3 |
| 7 | Heat and Thermodynamics | 12 | CO4 |
| 8 | Sound | 10 | CO4 |
| 9 | Properties of matter | 10 | CO5 |
| 10 | Electricity and Magnetism | 12 | CO5 |
| 11 | Modern physics | 10 | CO5 |
| **Total** | | **120** | |

| **Course Title: Engineering Physics** | |
|---|---|
| **Course Objectives** | 1. To familiarize with the concepts of Physics involved in the process of various Engineering, Industrial and Daily life Applications.<br>2. To understand and apply the basic principles of physics in the field of engineering and technology to familiarize certain natural phenomenon occurring in the day to day life<br>3. To reinforce theoretical concepts by conducting relevant experiments/exercises |

| | | |
|---|---|---|
| **Course Outcomes** | CO1 | Explain S.I units and dimensions of different physical quantities, basic operations among vector quantities. |
| | CO2 | Explain the motion of objects moving in one dimension and two dimensions, the causes of motion and hindrance to the motion of the objects especially with respect to friction. |
| | CO3 | Explain the mechanical energy of bodies like PE, KE and conservation law of energy, the properties of simple harmonic motion. |
| | CO4 | Explain gas laws, ideal gas equation, Isothermal and adiabatic processes, Specific heats, to study the laws of thermodynamics. Causes, consequences and methods to minimise noise pollution, explain beats, Doppler effect, Reverberation, echoes. |
| | CO5 | Explain certain properties of solids, liquids like elastic properties, viscosity and surface tension. Explain Ohm's law, to study Kirchoff's laws, to study the principle of Wheatstone's bridge and its application to meter bridge. To study the magnetic force and understand magnetic field. To compute magnetic field strength on axial and equatorial lines of a bar magnet. To familiarise with modern topics like photoelectric effect, optical fibres, superconductivity and nanotechnology. |

**COS, POS, PSOS MAPPING**

- POs mapping strength (as per given table)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | | | | | 1 | | 1 | 1 | 1 |
| CO2 | 3 | | 2 | | | | | 1 | 1 | |
| CO3 | 3 | | 2 | | | | | 1 | | |
| CO4 | 3 | 2 | | | 2 | | | | 2 | 2 |
| CO5 | 3 | | | 2 | | | 2 | 1 | 1 | |

3 = strongly mapped 2= moderately mapped 1= slightly mapped

Note:

The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:

i) Seminars ii) Tutorials iii) Guest lectures iv) Assignments v) Quiz competitions vi) Industrial visits vii) Tech Fest viii) Mini project ix) Group discussion x) Virtual classes xi) Library visit for e-books

**Learning Outcomes**

**1.0 Concept of Units and dimensions**

1.1 Explain the concept of Units, Physical quantity, Fundamental physical quantities and Derivedphysicalquantities
1.2 Define unit, fundamental units and derived units, State SI units with symbols
1.3 State Multiples and submultiples in SI system, State Rules of writing S.I. units, State advantages of SI units
1.4 Define Dimensions, Write Dimensional formulae of physical quantities
1.5 List dimensional constants and dimensionless quantities
1.6 State the principle of homogeneity of dimensions
1.7 State the applications and limitations of dimensional analysis
1.8 Errors in measurement, Absolute error, relative error, percentage error, significant figures
1.9 Solve problems

**2.0 Concept of Elements of Vectors**

2.1 Explain the concept of scalars, Vectors and give examples
2.2 Represent vectors graphically, Classify the Vectors, Resolve the vectors
2.3 Determine the resultant of a vector by component method, represent a vector in Space using unit vectors (i, j, k)
2.4 State and explain triangle law, parallelogram law, and polygon law of addition of Vectors
2.5 Define Dot product of two vectors with examples (Work done, Power), mention the Properties of dot product
2.6 Define cross product of two vectors with examples (Torque, Linear velocity) Mention the properties of Cross product.
2.7 Solve the related numerical problems

**3.0 Concept of Dynamics**

3.1 Write the equations of motion in a straight line. Explain the acceleration due to Gravity.
3.2 Explain vertical motion of a body and derive expressions for a) Maximum Height, b) Time of ascent, c) time of descent, and d) time of flight
3.3 Derive height of a tower when a body projected vertically upwards from the top of a tower.
3.4 Explain projectile motion with examples
3.5 Explain horizontal projection and derive an expression for the path of a projectile in horizontal projection
3.6 Explain oblique projection and derive an expression for it. Derive formulae for a) Maximum Height b) time of ascent c) time of descent and d) time of flight e) Horizontal Range, f) Maximum range

3.7 Define force, momentum, angular displacement, angular velocity, angular acceleration, angular momentum, moment of inertia, torque

3.8 Solve the related numerical problems

**4.0 Concept of Friction**

4.1 Define friction and classify the types of friction.

4.2 Explain the concept of normal reaction.

4.3 State the laws of friction.

4.4 Define coefficients of friction, Angle of friction and angle of repose.

4.5 Derive expressions for acceleration of a body on a rough inclined plane. (Upwards and downwards)

4.6 List the advantages and disadvantages of friction.

4.7 Mention the methods of minimizing friction.

4.8 Explain why it is easy to pull a lawn roller than to push it.

4.9 Solve the related numerical problems.

**5.0 Concepts of Work, Power, and Energy**

5.1 Define the terms Work, Power and Energy. State SI units and dimensional Formulae.

5.2 Define potential energy and give examples, derive an expression for potential energy.

5.3 Define Kinetic energy and give examples, derive an expression for kinetic energy.

5.4 State and derive Work-Energy theorem.

5.5 Derive the relation between Kinetic energy and momentum.

5.6 State the law of conservation of energy and verify it in the case of a freely falling body.

5.7 Solve the related numerical problems.

**6.0 Concepts of Simple harmonic motion**

6.1 Define Simple harmonic motion, Give examples, state the conditions.

6.2 Explanation of uniform circular motion of a particle is a combination of two perpendicular S.H.M.s.

6.3 Derive expressions for displacement, velocity, acceleration, Frequency, Time period of a particle executing SHM.

6.4 Define phase of SHM.

6.5 Define Ideal simple pendulum and derive expression for time period of simple pendulum.

6.6 State the laws of motion of simple pendulum.

6.7 Solve the related numerical problems.

**7.0 Concept of heat and thermodynamics**

7.1 Explain the concept of expansion of gases

7.2 State and explain Boyle's and Charles laws.

7.3 Define absolute zero temperature, absolute scale of temperature

7.4 Define ideal gas and distinguish from real gas

7.5 Derive Ideal gas equation. Define specific gas constant and universal gas constant, write S.I unit and dimensional formula. Calculate the value of R.

7.6 Explain why universal gas constant is same for all gases

7.7 State and explain isothermal process and adiabatic process

7.8 State first and second laws of thermodynamics and state applications

7.9 Define specific heats and molar specific heats of a gas, Derive $C_P$-$C_V$ =R

7.10 Solve the relevant numerical problems

**8.0 Concept of Sound**

8.1 Concept of the sound, Wave motion. (longitudinal and transverse wave)

8.2 Distinguish between musical sound and noise.

8.3 Explain noise pollution and state SI unit for intensity level of sound.

8.4 Explain causes, effects and methods of minimizing of noise pollution.

8.5 Explain the phenomenon of beats state the applications.

8.6 Define Doppler effect, list the applications.

8.7 Define reverberation and reverberation time and write Sabine's formula.

8.8 Define and explain echoes state its applications.

8.9 State conditions of good auditorium.

8.10 Solve the related numerical problems.

**9.0 Concepts of properties of matter**

9.1 Explain the terms elasticity, stress, strain and types of stress and strain.

9.2 State and explain Hooke's law.

9.3 Definitions of Modulus of elasticity, Young's modulus(Y), Bulk modulus (K), Rigidity modulus ( n),Poisson's ratio ($\sigma$),

9.4 Define surface tension and give examples.

9.5 Explain Surface tension with reference to molecular theory.

9.6 Define angle of contact and capillarity and write formula for Surface Tension.

9.7 Explain the concept of viscosity, give examples, write Newton's formula.

9.8 Define co-efficient of viscosity and write its units and dimensional formulaand State Poiseulle's equation for Co-efficient of viscosity.

9.9 Explain the effect of temperature on viscosity of liquids and gases.

9.10 Solve the related numerical problems.

**10. Concepts of Electricity and Magnetism**

10.1 Explain Ohm's law in electricity and write the formula.

10.2 Define specific resistance, conductance and state their units.

10.3 Explain Kichoff's laws.

10.4 Describe Wheatstone's bridge with legible sketch.

10.5 Describe Meter Bridge for the determination of resistivity with a circuit diagram.

10.6 Explain the concept of magnetism. State the Coulomb's inverse square law of Magnetism.

10.7 Define magnetic field and magnetic lines of force and write the properties of magnetic lines of force.

10.8 Derive an expression for the moment of couple on a bar magnet placed in a uniform magnetic field.

10.9 Derive equations for Magnetic induction field strength at a point on the axial line and on the equatorial line of a bar magnet.

10.10 Solvethe related numerical problems

**11.0 Concepts of modern physics**

11.1 State and explain Photo-electric effect and Write Einstein's photo electric Equation.

11.2 State laws of photo electric effect.

11.3 Explain the Working of photo electric cell, write its applications.

11.4 Recapitulation of refraction of light and its laws, critical angle, total Internal Reflection.
11.5 Explain the principle and working of Optical fiber, mention different types of Optical fiber, state the applications.
11.6 Define super conductor and super conductivity and mention examples.
11.7 State the properties of super conducting materials and list the applications.
11.8 Nanotechnology definition, nano materials, applications.

**COURSECONTENT**

**1. Units and Dimensions**:

Introduction, Physical quantity, Fundamental and Derived quantities, Fundamental and Derived units, SI units, Multiples and Sub multiples, Rules for writing S.I. units, Advantages of SI units. Dimensions and Dimensional formulae, Dimensional constants and Dimensionless quantities, Principle of homogeneity, Advantages and limitations of dimensional analysis, Errors in measurement, Absolute error, relative error, percentage error, significant figures, Problems.

**2. Elements of Vectors**:

Scalars and Vectors, Types of vectors (Proper Vector, Null Vector, Unit Vector, Equal, Negative Vector, Like Vectors, Co-Initial Vectors, Co-planar Vectors and Position Vector).Addition of vectors, Representation of vectors, Resolution of vectors, Parallelogram, Triangle and Polygon laws of vectors, Subtraction of vectors, Dot and Cross products of vectors-Problems.

**3. Dynamics**

Introduction-Concept of acceleration due to gravity-Equations of motion for a freely falling body and for a body thrown up vertically- Projectiles- Horizontal and Oblique projections-Expressions for maximum height, time of flight, range-Define force, momentum, angular displacement, angular velocity, angular acceleration, angular momentum, moment of inertia, torque–problems.

**4. Friction:**

Introduction to friction- Causes- Types of friction- Laws of friction- Angle of repose-Angle of friction- rough inclined plane- Advantages and disadvantages of friction-Methods of reducing friction–Problems.

**5. Work, Power and Energy:**

Work, Power and Energy- Definitions and explanation- potential energy- kinetic energy-Derivations of Potential and Kinetic energies-K.E and Momentum relation - Work-Energy theorem- Law of Conservation of energy- Problems.

**6. Simple Harmonic Motion:**

Introduction- Conditions of SHM- Definition- Examples- Expressions for displacement, velocity, acceleration, Time period, frequency and phase in SHM- Time period of a simple pendulum- Laws of simple pendulum-seconds pendulum-Problems.

**7. Heat and Thermodynamics:**

Expansion of Gases, Boyle's law, absolute scale of temperature- Charles laws- Ideal gas equation- Universal gas constant- Differences between gas constant(r) and universal gas constant(R),Isothermal and adiabatic processes, Laws of thermodynamics, Specific heats - molar specific heats of a gas -Different modes of transmission of heat,laws of thermal conductivity, Coefficient of thermal conductivity-Problems.

**8. Sound:**

Sound- Nature of sound- Types of wave motion -musical sound and noise- Noise pollution – Causes &effects- Methods of reducing noise pollution- Beats- Doppler effect- Echo- Reverberation-Reverberation time-Sabine 's formula-Conditions of good auditorium- Problems.

**9. Properties of matter**

Definition of Elasticity –Definition of stress and strain -the units and dimensional formulae for stress and strain-The Hooke's law-Definitions of Modulus of elasticity, Young's modulus(Y), Bulk modulus(K), Rigidity modulus ( n),Poisson's ratio ($\sigma$), relation between Y, K, n and $\sigma$(equations only no derivation)

Definition of surface tension-Explanation of Surface tension with reference to molecular theory - Definition of angle of contact -Definition of capillarity -The formula for surface tension based on capillarity - Explanation of concept of Viscosity - Examples for surface tension and Viscosity - Newton's formula for viscous force- Definition of co-efficient of viscosity- The effect of temperature on viscosity of liquids and gases - Poiseuille's equation for Co-efficient of viscosity- The related numerical problems.

**10. Electricity & Magnetism:**

Ohm's law and explanation, Specific resistance, Kirchoff's laws, Wheatstone's bridge, Meter bridge, Coulomb's inverse square law, magnetic field, magnetic lines of force, magnetic induction field strength- magnetic induction field strength at a point on the axial line - magnetic induction field strength at a point on the equatorial line–problems.

**11. Modern Physics;**

Photoelectric effect –Einstein's photoelectric equation-laws of photoelectric effect-photoelectric cell–Applications of photo electric effect- Total internal reflection- fiber optics- - principle and working of an optical fiber-types of optical fibers - Applications of optical fibers- superconductivity–applications-Nanotechnology definition, nano materials, applications

**REFERENCEBOOKS**


| | |
|---|---|
| 1. Telugu Academy ( English version ) | Intermediate physics Volume-I & 2 |
| 2. Dr. S. L. Guptha and Sanjeev Guptha | Unified physics Volume 1,2,3 and 4 |
| 3. Resnick& Holiday | Text book of physics Volume I |
| 4. Dhanpath Roy | Text book of applied physics |
| 5. D.A Hill | Fiber optics |
| 6. XI & XII Standard | NCERT Text Books |

➢ **Model Blue Print with Weightage for Blooms category and questions for chapter and Cos mapped**

| S. No | Unit Title/Chapter | No of Periods | Weightage of marks | Marks wise distribution of Weightage | | | | Question wise distribution of Weightage | | | | Mapped with CO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | R | U | Ap | An | R | U | Ap | An | |
| 1 | Units and Dimensions | 08 | 03 | 3 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | CO1 |
| 2 | Elements of Vectors | 12 | 11 | 3 | 8 | 0 | 0 | 1 | 1 | 0 | 0 | CO1 |
| 3 | Dynamics | 12 | 11 | 3 | 8 | 0 | 0 | 1 | 1 | 0 | * | CO2 |
| 4 | Friction | 10 | 11 | 3 | 0 | 8 | 0 | 1 | 0 | 1 | 0 | CO2 |
| 5 | Work, Power and Energy | 12 | 11 | 3 | 8 | 0 | 0 | 1 | 1 | 0 | 0 | CO3 |
| 6 | Simple harmonic motion | 12 | 11 | 3 | 8 | 0 | 0 | 1 | 1 | 0 | * | CO3 |
| 7 | Heat and Thermodynamics | 12 | 11 | 0 | 8 | 3 | 0 | 0 | 1 | 1 | * | CO4 |
| 8 | Sound | 10 | 11 | 0 | 8 | 3 | 0 | 0 | 1 | 1 | 0 | CO4 |
| 9 | Properties of matter | 10 | 08 | 0 | 8 | 0 | 0 | 0 | 1 | 0 | 0 | CO5 |
| 10 | Electricity and Magnetism | 12 | 14 | 6 | 0 | 8 | 0 | 2 | 0 | 1 | 0 | CO5 |
| 11 | Modern physics | 10 | 08 | 0 | 8 | 0 | 0 | 0 | 1 | 0 | 0 | CO5 |
| **Total** | | **120** | **110** | **24** | **64** | **22** | **0** | **8** | **8** | **4** | ***10** | |

***One question of HOTs for 10 marks from any of the unit title 3 or 6 or 7**

➢ **Table specifying the scope of syllabus to be covered for Unit Tests**

| **Unit Test** | **Learning outcomes to be covered** |
|---|---|
| Unit Test – 1 | From 1.1 to 4.9 |
| Unit Test – 2 | From 5.1 to 7.10 |
| Unit Test – 3 | From 8.1 to 11.8 |

➢ **Model question paper for Unit Tests I,II,III with COs mapped**

**UNIT TEST –I**

**Model Question Paper (C-20)**

**ENGINEERING PHYSICS (103)**

TIME: 90 minutes Total Marks: 40

**PART-A 16 Marks**

**Instructions: (1) Answer all questions.**
**(2) First question carries 4 marks and others carry 3 marks each.**
**(3) Answers for the Question numbers 2 to 5 should be brief and straight to the point and shallnot exceed five simple sentences.**

1. i) The dimensional formula of force is _____ **(CO1)**
   ii) Which of the following is a scalar [ ] **(CO1)**
   a) force b) work c) displacement d) velocity
   iii) We can add a scalar to a vector (Yes / No) **(CO1)**
   iv) Friction is a self-adjusting force. [True / False] **(CO2)**
2. Define dot product. Give one example. **(CO1)**
3. A force of 150 N acts on a particle at an angle of 30° to the horizontal. Find the horizontal and vertical components of force. **(CO1)**
4. Define projectile. Give two examples. **(CO2)**
5. It is easier to pull a lawn roller than to push it. Explain **(CO2)**

**PART—B 3x8=24**

**Instructions: (1) Answer all questions. Each question carries 8marks.**
**(2) Answer should be comprehensive and the criteria for evaluation is content but not the length of the answer.**

6) (A) Derive an expression for magnitude and direction of resultant of two Vectors using parallelogram law of vectors **(CO1)**

OR

(B) Write any four properties of dot product and any four properties of Cross product **(CO1)**

7) (A) Show that path of a projectile is a parabola in case of oblique Projection. **(CO2)**

OR

(B) Derive the expression for range and time of flight of a projectile **(CO2)**

8) (A) State and explain polygon law of vector addition with a neat diagram **(CO1)**

OR

(B) Derive the equation for acceleration of a body on a rough inclined plane **(CO2)**

***

**UNIT TEST –II**

**Model Question Paper (C-20)**

**ENGINEERING PHYSICS (C–103)**

**TIME: 90 minutes** **Total Marks: 40**

**PART –A** **16 Marks**

**Instructions: (1) Answer all questions.**
**(2) First question carries 4 marks and others carry 3 marks each.**
**(3) Answers for the Question numbers 2 to 5 should be brief and Straight to the point and shall not exceed five simple sentences.**

1) i) The value of $100^0$ C is equal to _____ in Kelvin scale of temperature **(CO4)**

ii) Write the S.I unit of power **(CO3)**

iii) A simple pendulum be used in artificial satellite (Yes / No) **(CO3)**

iv) Specific heat of a gas is constant for all gases in nature [True / False] **(CO4)**

2. Derive the relation between momentum and kinetic energy **(CO3)**

3. A girl is swinging by sitting in a swing, how the frequency changes if she stands in the swing. **(CO3)**

4. Write the physical significance of universal gas constant. **(CO4)**

5. A body is projected in to the air in the vertically upward direction, find the height at which its potential and kinetic energies are equal. **(CO3)**

**PART—B** **3x8=24 Marks**

**Instructions: (1) Answer all questions. Each question carries 8marks.**
**(2) Answer should be comprehensive and the criteria for evaluation is content but not the length of the answer.**

6) (A) State the law of conservation of energy and verify it in case of a freely falling body. **(CO3)**

(OR)

(B) State and prove work energy theorem. **(CO3)**

7) (A) Define ideal simple pendulum and derive the equation for time period of a simple pendulum **(CO3)**

(OR)

(B) State the conditions for S.H.M, derive the equation for velocity for a Particle in S.H.M. **(CO3)**

8) (A) Define ideal gas, show that for an ideal gas the difference in specific heats is equal to universal gas constant **(CO4)**

(OR)

(B) State gas laws and derive the ideal gas equation **(CO4)**

***

**UNIT TEST –III**

**Model Question Paper (C-20)**

**ENGINEERING PHYSICS (C–103)**

**TIME: 90 minutes** **Total Marks: 40**

**PART –A** **16 Marks**

**Instructions: (1) Answer all questions.**
**(2) First question carries 4 marks and others carry 3 marks each.**
**(3) Answers for the Question numbers 2 to 5 should be brief and straight to the point and shall not exceed five simple sentences.**

1) i) Photo electric cell converts light energy in to _____ energy **(CO5)**

ii) What is elastic limit ? **(CO5)**

iii) SI unit of Specific resistance is ---------- **(CO5)**

iv) Inside a bar magnet magnetic line of force will travel from North pole to South pole [True / False] **(CO5)**

2. Distinguish between Musical sound and Noise **(CO4)**

3. What is the effect of temperature on Viscosity of liquids and gases **(CO5)**

4. The values of resistances P, Q, R are 50 Ω, 10Ω, 15 Ω respectively in the balanced condition of Wheatstone bridge, find the unknownresistance **(CO5)**

5. What is nanotechnology and write any two uses. **(CO5)**

**PART—B** **3x8=24 Marks**

**Instructions: (1) Answer all questions. Each question carries 8marks.**
**(2) Answer should be comprehensive and the criteria for evaluation is content but not the length of the answer**.

6) (A) Explain Surface Tension based on the molecular theory **(CO5)**

(OR)

(B)Define Reverberation and Reverberation Time. Derive Sabine formula for reverberation time. **(CO4)**

7) (A) Derive the balancing condition of Wheatstone bridge with neat circuit Diagram. **(CO5)**

(OR)

(B) Derive an expression for the magnetic induction field strength at a point on the equatorial line of a bar magnet. **(CO5)**

8) (A) Describe an experiment to determine the specific resistance of a wire using meter bridge. **(CO5)**

(OR)

(B) Explain the principle and working of an optical fiber. **(CO5)**

***

**BOARD DIPLOMA EXAMINATION, (C–20)**
**FIRST YEAR EXAMINATION**
**C–103, ENGINEERING PHYSICS**

**Time : 3 hours ]** **[ Total Marks : 80M**

**PART—A** **3×10=30**

**Instructions: (1) Answer all questions.**
**(2) Each question carries three marks.**
**(3) Answers should be brief and straight to the point and shall not exceed five simple Sentences.**

1. Write the dimensional formula of the following physical quantities **(CO1)**
   (a) Velocity (b) Force (c) Angular momentum
2. Write any three properties of scalar product .**(CO1)**
3. Define projectile. Give two examples. **(CO2)**
4. It is easier to pull a lawn roller than to push it. Explain .**(CO2)**
5. Define potential energy and kinetic energy. **(CO3)**
6. For a body in simple harmonic motion velocity at mean position is 4m/s, if the time period is 3.14 s, find its amplitude. **(CO3)**
7. State first and second laws of thermodynamics. **(CO4)**
8. Write any three conditions of good auditorium **(CO4)**
9. Define ohmic and non-ohmic conductors. **(CO5)**
10. State Coulomb's inverse square law of magnetism .**(CO5)**

**PART—B** **8 ×5= 40**

**Instructions: (1) Each question carries eight marks.**
**(2) Answers should be comprehensive and the criterion for valuation is the content Butnot the length of the answer.**

11. A) Derive an expression for magnitude and direction of the resultant of two vectors using Parallelogram law of vectors. **(CO1)**

    OR

    B) Show that path of a projectile is parabola in case of oblique projection and derive expression for maximum height. **(CO2)**

12. A) Derive expression for acceleration of a body sliding downwards on a rough inclined plane**.** **(CO2)**

    OR

    B) Verify the law of conservation of energy in case of a freely falling body**.** **(CO3)**

13. A) Derive an expression for velocity and acceleration of a particle performing simple harmonic Motion. **(CO3)**

    OR

    B) Define ideal gas and derive ideal gas equation**.** **(CO4)**

14. A) Two tuning forks A and B produce 4 beats per second. On loading B with wax 6 beats are produced. If the quantity of wax is reduced the number of beats drops to 4. If the frequency of A is 326 Hz, find the frequency of B**.** **(CO4)**

OR

B) Explain surface tension based on molecular theory. Write three examples of surface tension. **(CO5)**

15. A) Derive an expression for balancing condition of Wheat stone's bridge with a neat circuit diagram. **(CO5)**

OR

B) Explain principle and working of optical fibers. Write any three applications . **(CO5)**

**PART C** **1 x 10 = 10**

16) Derive relationship between molar specific heat of a gas at constant pressure $C_p$ and molar specific heat of a gas at constant volume $C_v$ and hence show that $C_p$ is greater than $C_v$. **(CO4)**

***

| Course code | Course Title | No. of Periods per week | Total No. of Periods | Marks for FA | Marks for SA |
|---|---|---|---|---|---|
| C-104 | Engineering Chemistry and Environmental Studies | 4 | 120 | 20 | 80 |

| S.No | Unit Title/Chapter | No of Periods | COs Mapped |
|---|---|---|---|
| 1 | Fundamentals of Chemistry | 18 | CO1 |
| 2 | Solutions | 10 | CO1 |
| 3 | Acids and bases | 10 | CO1 |
| 4 | Principles of Metallurgy | 8 | CO1 |
| 5 | Electrochemistry | 16 | CO2 |
| 6 | Corrosion | 8 | CO2 |
| 7 | Water Treatment | 10 | CO3 |
| 8 | Polymers | 12 | CO4 |
| 9 | Fuels | 6 | CO4 |
| 10 | Chemistry in daily life | 6 | CO4 |
| 11 | Environmental Studies | 16 | CO5 |
| | **Total** | **120** | |

- **Course Objectives**

| **Course Title: Engineering Chemistry & Environmental Studies** | |
|---|---|
| **Course Objectives** | 1. To familiarize with the concepts of chemistry involved in the process of various Engineering Industrial Applications.<br>2. To know the various natural and man-made environmental issues and concerns with an interdisciplinary approach that include physical, chemical, biological and socio cultural aspects of environment.<br>3. To reinforce theoretical concepts by conducting relevant experiments/exercises |

➢ **Course outcomes**

| | | |
|---|---|---|
| **Course Outcomes** | CO1 | Explain Bohr`s atomic model, chemical bonding, mole concept, acids and bases, $P^H$ metallurgical process and alloys |
| | CO2 | Explain electrolysis, Galvanic cell, emf and corrosion |
| | CO3 | Explain the chemistry involved in the treatment of water by advanced method |
| | CO4 | Synthesise of Plastics, rubber and applications of fuel chemical compounds used in our daily life. |
| | CO5 | Explain the causes, effects and control methods of air and water pollution and measures to protect the environment |

| **Course code C-104** | **Engg. Chemistry and Environmental studies**<br>**No of Cos;5** | | | | **No Of periods 120** |
|---|---|---|---|---|---|
| **POs** | **Mapped with CO No** | **CO periods addressing PO in Col 1**<br>**NO** | **%** | **Level 1,2,3** | **remarks** |
| PO1 | CO1,CO2,CO3, CO4,CO5 | 60 | 50% | 3 | >40% level 3 (highly addressed) 25% to 40% level2(moderately addressed 5% to 25% level1 (Low addressed < 5%(not addressed) |
| PO2 | CO1,CO2 | 13 | 10.8% | 1 | |
| PO3 | CO2,CO3 | 10 | 8.3% | 1 | |
| PO4 | CO1 | 10 | 8.3% | 1 | |
| PO5 | CO4,CO5 | 15 | 12.5 | 1 | |
| PO6 | | | | | |
| PO7 | CO4 | 12 | 10% | 1 | |

- COs-POs mapping strength (as per given table)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | | 1 | | | | 1 | 1 | |
| CO2 | 3 | 1 | 2 | | | | | 1 | 1 | |
| CO3 | 3 | | 2 | | | | | | | |
| CO4 | 3 | | | | 1 | | 2 | | | |
| CO5 | 3 | | | | 3 | | | 1 | | |

3 = strongly mapped

2= moderately mapped

1= slightly mapped

Note: The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:

i) Seminars ii) Tutorials iii) Guest Lectures iv) Assignments v) Quiz competitions vi) Industrial visit vii) Tech Fest viii) Mini project ix) Group discussions x) Virtual classes xi) Library visit for e-books

- **Model Blue Print with Weightage for Blooms category and questions for each chapter and COs mapped**

| S.No | Unit Title/Chapter | No of Periods | Weightage of marks | Marks wise distribution of Weightage | | | | Question wise distribution of Weightage | | | | Mapped with CO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | R | U | Ap | An | R | U | Ap | An | |
| 1 | Fundamentals of Chemistry | 18 | 19 | 8 | 8 | 3 | | 1 | 1 | 1 | | CO1 |
| 2 | Solutions | 10 | 11 | 0 | 0 | 8 | 3 | | | 1 | 1 | CO1 |
| 3 | Acids and bases | 10 | 11 | 0 | 8 | 0 | 3 | | 1 | | 1 | CO1 |
| 4 | Principles of Metallurgy | 8 | 8 | 8 | 0 | 0 | | 1 | | | | CO1 |
| 5 | Electrochemistry | 16 | 11 | 8 | 3 | 0 | | 1 | 1 | | * | CO2 |
| 6 | Corrosion | 8 | 8 | 0 | 8 | 0 | | | 1 | | | CO2 |
| 7 | Water Treatment | 10 | 11 | 8 | 3 | 0 | | 1 | 1 | | | CO3 |
| 8 | Polymers | 12 | 11 | 3 | 8 | 0 | | 1 | 1 | | * | CO4 |
| 9 | Fuels | 6 | 3 | 3 | 0 | 0 | | 1 | | | | CO4 |
| 10 | Chemistry in daily life | 6 | 3 | 0 | 0 | 3 | | | | 1 | | CO4 |
| 11 | Environmental Studies | 16 | 14 | 3 | 11 | 0 | | 1 | 2 | | | CO5 |
| **Total** | | **120** | **110** | **12** | **6** | **6** | **6** | **20** | **35** | **5** | ***10** | |

***One question of HOTs for 10 marks from any of the unit title 5 or 8**

**Upon completion of the course the student shall be able to learn out**

**ENGINEERINGCHEMISTRY AND ENVIRONMENTAL STUDIES**

## 1.0 Atomic structure

1.1 Explain the charge, mass of fundamental particles of an atom (electron, proton and neutron) and the concept of atomic number and mass number.

1.2 State the Postulates of Bohr's atomic theory and its limitations.

1.3 Explain the significance of four Quantum numbers.

1.4 Explain1. Aufbau principle, 2 Pauli's exclusion principle 3 Hund's rule.

1.5 Define Orbital of an atom and draw the shapes of s, p and d- Orbitals.

1.6 Write the electronic configuration of elements up to atomic number 30

1.7 Explain the significance of chemical bonding

1.8 Explain the Postulates of Electronic theory of valency

1.9 Define and explain Ionic and Covalent bonds with examples of NaCl , MgO, $*H_2$,$*O_2$ and $*N_2$. (* Lewis dot method)

1.10 List out the Properties of Ionic compounds and covalent compounds and distinguish between their properties.

1.11 Structures of ionic solids-define a) Unit cell b) co-ordination number and the structures of NaCl and CsCl unit cells.

**2.0 Solutions**

2.1 Define the terms 1.Solution, 2.Solute and 3.Solvent

2.2 Classify solutions based on physical state and solubility

2.3 Define mole and problems on mole concept.

2.4 Define the terms 1. Atomic weight, 2.Molecular weight and 3. Equivalent weight and calculate Molecular weight and Equivalent weight of the given acids.($HCl$,$H_2SO_4$,$H_3PO_4$)Bases ($NaOH$, $Ca(OH)_2$, $Al(OH)_3$ ) and Salts ($NaCl$, $Na_2CO_3$, $CaCO_3$)

2.5 Define molarity and normality and numerical problems on molarity and normality

a) Calculate the Molarity or Normality if weight of solute and volume of solution are given

b) Calculate the weight of solute if Molarity or normality with volume of solution are given

c) Problems on dilution to convert high concentrated solutions to low concentrated Solutions

**3.0 Acids and bases**

3.1 Explain Arrhenius theory of Acids and Bases and give the limitations of Arrhenius theory of Acids and Bases.

3.2 Explain Bronsted–Lowry theory of acids and bases and give the limitations of Bronsted–Lowry theory of acids and bases.

3.3 Explain Lewis theory of acids and bases and give the limitations of Lewis theory of acids and bases.

3.4 Explain the Ionic product of water

3.5 Define pH and explain $P^H$ scale and solve the Numerical problems on pH(Strong Acids and Bases)

3.6 Define and explain buffer solution and give the examples of buffer solutions.

3.7 State the application of buffer solutions

**4.0 Principles of Metallurgy**

4.1 List out the Characteristics of Metals and non-metals

4.2 Distinguish between Metals and Non-metals

4.3 Define the terms1.Mineral, 2.Ore, 3. Gangue, 4.Flux5.Slag

4.4 Describe the methods of concentration of Ore; 1.Handpicking, 2.Levigation and 3. Froth Floatation

4.5 Describe the methods involved in extraction of crude metal- Roasting, Calcination and Smelting.

4.6 Explain the purification of Copper by Electrolytic Refining

4.7 Define an Alloy and Write the composition and uses of the following alloys. 1. Brass 2. Germen silver 3. Nichrome.

**5.0 Electrochemistry**

5.1 Define the terms1. Conductor 2. Semiconductor 3.Insulator, 4.Electrolyte5.Non–electrolyte.Give two examples each.

5.2 Distinguish between metallic conduction and Electrolytic conduction

5.3 Explain electrolysis by taking example fused NaCl

5.4 Explain Faraday's laws of electrolysis

5.5 Define1. Chemical equivalent (E) 2. Electrochemicalequivalent (e) and their relation.

5.6 Solve the Numerical problems on Faraday's laws of electrolysis and applications of electrolysis (Electro plating)

5.7 Define Galvanic cell and explain the construction and working of Galvanic cell.

5.8 Distinguish between electrolytic cell and galvanic cell

5.9 Explain the electrode potentials and standard electrode potentials

5.10 Explain the electrochemical series and its significance

5.11 Explain the emf of a cell and solve the numerical problems on emf of the cell based on standard electrode potentials.

**6.0 Corrosion**

6.1 Define the term corrosion.

6.2 state the Factors influencing the rate of corrosion

6.3 Describe the formation of a) composition cell b) stress cell c)concentration cell during corrosion.

6.4 Define rusting of iron and explain the mechanism of rusting of iron.

6.5 Explain the methods of prevention of corrosion

a)Protective coatings (anodic and cathodic coatings)

b) Cathodicprotection (Sacrificial anode process and Impressed–voltage process)

**7. 0 Water Treatment**

7.1 Define soft water and hard water with respect to soap action.

7.2 Define and classify the hardness of water.

7.3 List out the salts that causing hardness of water (with Formulae)

7.4 State the disadvantages of using hard water in industries.

7.5 Define Degree of hardness and units of hardness (mg/L) or( ppm).

7.6 Explain the methods of softening of hard water: a) Ion-exchange process, b)Permutit process or zeolite process

7.7 State the essential qualities of drinking water.

7.8 Chemistry involved in treatment of water (Coagulation, Chlorination, deflouridation)

7.9 Explain Osmosis and Reverse Osmosis with examples.

7.10 State the applications of Reverse Osmosis.

**8.0 Polymers**

8.1 Explain the concept of polymerisation

8.2 Describe the methods of polymerization a)addition polymerization of ethylene

b)condensation polymerization of Bakalite(Only flow chart)

8.3 Define thermoplastics and thermosetting plastics with examples.

8.4 Distinguish between thermo plastics and thermosetting plastics

8.5 List the Characteristics of plastics and state the disadvantages of using plastics.

8.6 State the advantages of plastics over traditional materials.

8.7 Explain the methods of preparation and uses of the following plastics:

1. PVC, 2.Teflon, 3. Polystyrene 4. Nylon 6,6

8.8 Explain processing of Natural rubber and write the structural formula of Natural rubber.

8.9 List the Characteristics of raw rubber

8.10 Define and explain Vulcanization and List out the Characteristics of Vulcanized rubber.

8.11 Define the term Elastomer and describe the preparation and uses of the following synthetic rubbers a) Buna-s and b)Neoprene rubber.

**9.0 Fuels**

9.1 Define the term fuel

9.2 Classify the fuels based on physical state and based on occurrence.

9.3 List the characteristics of good fuel.

9.4 State the composition and uses of gaseous fuels.
a)water gas b) producer gas, c) natural gas, d) Coal gas, e)Biogas.

**10.0 Chemistry in daily life**

10.1 Give the basic chemical composition, applications, health aspects and pollution impacts of
a) soaps, and detergents b) vinegar c) Insect repellents d) activated charcoal e) Soft drinks

**11.0 ENVIRONMENTALSTUDIES**

11.1 Define the term environment and explain the scope and importance of environmental studies

11.2 Define the segments of environment 1).Lithosphere, 2).Hydrosphere, 3).Atmosphere, 4).Biosphere,

11.3 Define the following terms 1)Pollutant, 2).Pollution, 3).Contaminant, 4)receptor, 5)sink, 6) particulates, 7)dissolved oxygen (DO), 8)Threshold limit value (TLV), 9).BOD,10).COD 11) eco system12) Producers13) Consumers 14) Decomposers with examples

11.4 State the renewable and non renewable energy sources with examples.

11.5 Explain biodiversity and threats to biodiversity

11.6 Define air pollution and classify the air pollutants-based on origin and physical state of matter.

11.7 Explain the causes, effects of air pollution on human beings, plants and animals and control methods of air pollution.

11.8 State the uses of forest resources.

11.9 Explain causes and effects of deforestation

11.10 Explain the causes and effects of the following
1) Greenhouse effect, 2) Ozone layer depletion and 3) Acid rain

11.11 Define Water pollution, explain the causes, effects and control methods of Water pollution.

**COURSE CONTENT**

**ENGINEERING CHEMISTRY AND ENVIRONMENTAL STUDIES**

1. **Fundamentals of Chemistry**

   **Atomic Structure:** Introduction - Fundamental particles – Bohr's theory – Quantum numbers –Aufbau principle - Hund's rule - Pauli's exclusion Principle- Orbitals, shapes of s, p and d orbitals - Electronic configurations of elements

   **Chemical Bonding:** Introduction – types of chemical bonds – Ionic and covalent bond with examples–Properties of Ionic and Covalent compounds- structures of ionic crystals (NaCl and CsCl).

2. **Solutions**

   Introduction of concentration methods – mole concept, molarity and normality – Numerical problems on mole, molarity and normality.

3. **Acids and Bases**

   Introduction – Theories of acids and bases and limitations – Arrhenius theory- Bronsted – Lowry theory – Lewis acid base theory – Ionic product of water- pHrelated numerical problems–Buffer solutions, action of buffer and its applications.

4. **Principles of Metallurgy**

   Characteristics of Metals and non-metals –Distinguish between Metals and Non-metals, Define the terms i) Metallurgy ii) ore iii) Gangue iv) flux v) Slag - Concentration of Ore –Hand picking, Levigation, Froth floatation – Methods of Extraction of crude Metal – Roasting, Calcination, Smelting – Alloys – Composition and uses of brass, German silver and nichrome.

5. **Electrochemistry**

   Conductors, semiconductors, insulators, electrolytes and non-electrolytes – electrolysis – Faraday's laws of electrolysis-application of electrolysis(electroplating) -numerical problems on Faraday's laws – Galvanic cell – standard electrode potential – electrochemical series–emf and numerical problems on emf of a cell .

6. **Corrosion**

   Introduction - factors influencing corrosion - composition, stress and concentration cells– rusting of iron and its mechanism – prevention of corrosion by coating methods, cathodic protection methods.

7. **Water technology**

   Introduction–soft and hard water–causes of hardness–types of hardness –disadvantages of hard water – degree of hardness (ppm and mg/lit) – softening methods – permutit process – ion exchange process– qualities of drinking water –Chemistry involved in treatment of water (Coagulation, Chlorination, defluoridation ) - Osmosis, Reverse Osmosis – Applications of Reverse osmosis.

8. **Polymers**

   Introduction – polymerization – types of polymerization – addition, condensation with examples – plastics – types of plastics – advantages of plastics over traditional materials- Disadvantages of using plastics – Preparation and uses of the following plastics i).PVC ii) Teflon iii) Polystyrene iv) .Nylonn 6,6 –Processing of natural rubber - Vulcanization – Elastomers- Preparation and applications of Buna-s, Neoprene rubbers.

9. **Fuels**

   Definition and classification of fuels–characteristics of good fuel-composition and uses of gaseous fuels.

10. **Chemistry in daily life**

    Basic composition, applications, health aspects and pollution impacts of soaps and detergents, vinegar, insect repellents, soft drinks, activated charcoal.

11. **ENVIRONMENTALSTUDIES**

Introduction– environment –scope and importance of environmental studies – important terms related to environment– renewable and non-renewable energy sources–Concept of ecosystem – Biotic components –Forest resources – Deforestation -Biodiversity and its threats-Air pollution – causes-effects–Global environmental issues – control measures – Water pollution – causes – effects – control measures.

**REFERENCEBOOKS**


1. Telugu Academy — Intermediate chemistry Vol 1&2
2. Jain & Jain — Engineering Chemistry
3. O.P. Agarwal, — Hi- Tech. Engineering Chemistry
4. Sharma — Engineering Chemistry
5. A.K. De — Engineering Chemistry


Table specifying the scope of syllabus to be covered for unit test 1, unit test 2 and unit test 3

| **Unit Test** | **Learning outcomes to be covered** |
|---|---|
| Unit Test - 1 | From 1.1 to 3.7 |
| Unit Test - 2 | From 4.1 to 7.10 |
| Unit Test - 3 | From 8.1 to 11.11 |

**Model question paper for Unit Test with Cos mapped**

**UNIT TEST –I**

**Model Question Paper (C-20)**

ENGINEERING CHEMISTRY & ENVIRONMENTAL STUDIES (104)

TIME: 90 minutes Total Marks: 40

**PART-A** **16 Marks**

**Instructions: (1) Answer all questions.**

**(2) First question carries 4 marks and each of rest carries 3 marks.**

**(3) Answers for Q.No. 2 to 5 should be brief and straight to the point and shall not exceed five simple sentences.**

1. a. Number of neutrons in $_{11}Na^{23}$ is ---------- **(CO1)**

   b. The molarity and normality of HCl is the same (True or False) **(CO1)**

   c. What is the $p^H$ range of base? **(CO1)**

   d. Graphite is a good conductor of electricity (Yes or No) **(CO1)**

**2.** Distinguish between orbit and orbital. **(CO1)**

3. Define Covalent bond. Explain the formation of covalent bond in Oxygen and Nitrogen molecules. **(CO1)**

4. Define mole. Calculate the number of moles present in 50 gm of $CaCO_3$ and 9.8 gm of $H_2SO_4$. **(CO1)**

5. Define $P^H$. Calculate the $P^H$ of 0.001M HCl and 0.01M NaOH solution. **(CO1)**

**PART – B** **3x8M = 24M**

**Answer either (A) or (B) from each questions from Part-B.Each question carries 8 marks.**

6. A) Explain Postulations of Bhor's atomic theory. Give its limitations. **(CO1)**

   (OR)

   B) Explain the significance of Quantum numbers. **(CO1)**

7. A) Express molarity normality with mathematical equation. Calculate the molarity and normality of 10gm of NaOH present in 500 ml solution. **(CO1)**

   (OR)

   B) Classify solutions based the physical state of solute and solvent and give an example each. **(CO1)**

8. A) What is buffer solution? Classify with examples and give it`s applications. **(CO1)**

   (OR)

   B) Explain Bronsted-Lowry theory of acids and bases. Give its limitations. **(CO1)**

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**UNIT TEST –II**

**Model Question Paper (C-20)**

**ENGINEERING CHEMISTRY & ENVIRONMENTAL STUDIES (104)**

**TIME: 90 minutes** **Total Marks:40Marks**

**PART-A** **16 Marks**

**Instructions: (1) Answer all questions.**

**(2) First question carries 4 marks and each of rest carries 3 marks.**

**(3) Answers for Q.No. 2 to 5 should be brief and straight to the point and shall not exceed five simple sentences.**

1. a) Bauxite is the ore of ..... metal **(CO2)**

   b) What is the unit of electrochemical equivalent? **(CO2)**

   c) $CaSO_4$ is the permanent hardness causing salt. (True or False) **(CO3)**

   d) Write the Chemical formula of rust **(CO2)**

2. Write any three differences between metallic conduction and electrolytic conduction.**(CO2)**
3. Write the composition and applications of German silver and Nichrome. **(CO1)**
4. Mention any three disadvantages of using hard water in industries. **(CO3)**
5. Define electro chemical equivalent and chemical equivalent. Give the relation between them. **(CO2)**

**PART – B** **3x8M = 24M**

**Instructions : Answer either (A) or (B) from each questions from Part-B.**
**Each question carries 8 marks.**

6. A) What is galvanic cell? Explain construction and working of galvanic cell with neat diagram **(CO2)**

   (OR)

   B) State and explain Faraday`s laws of electrolysis. **(CO2)**
7. A) Explain different types of galvanic cells formed during the corrosion of metals.**(CO2)**

   (OR)

   B) What is hard water? Explain zeolite process of softening of hard water. **(CO3)**
8. A) Explain Froth floatation process. **(CO1)**

   (OR)

   B) Explain Electrolytic refining processing of copper. **(CO1)**

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**UNIT TEST –III**

**Model Question Paper (C-20)**

**ENGINEERING CHEMISTRY & ENVIRONMENTAL STUDIES (104)**

TIME: 90 minutes Total Marks:40

**PART-A** **16 Marks**

**Instructions: (1) Answer all questions.**

**(2) First question carries 4 marks and each of rest carries 3 marks.**

**(3) Answers for Q. No. 2 to 5 should be brief and straight to the point and shall not exceed five simple sentences.**

1. a) The monomer of PVC..... **(CO4)**

   b) Sulphur is the vulcanising agent. (True/False) **(CO4)**

   c) Give an example for secondary pollutant. **(CO5)**

   d) Presence of ozone in stratosphere is a pollutant.( Yes/No) **(CO5)**

2. List any three characteristic properties of vulcanised rubber. **(CO4)**
3. Define primary fuel and secondary fuels give an example each. **(CO4)**
4. Mention the basic chemical composition and applications of vinegar. **(CO4)**
5. Write any three threats to the biodiversity **(CO5)**

**PART – B** **3x8M = 24M**

**Instruction : Answer either (A) or (B) from each questions from Part-B.**
**Each question carries 8 marks.**

6. A) Explain addition and condensation polymerisation with an example each. **(CO4)**

   (OR)

   B) Give a method of preparation and applications of the following
   i) Buna-S ii) Neoprene **(CO4)**
7. A) What is air pollution? Explain any three causes of air pollution. **(CO5)**

   (OR)

   B) Briefly explain ozone layer depletion and green houseeffect. **(CO5)**
8. A) What is water pollution? Explain any three controlling methods of water pollution.**(CO5)**

   (OR)

   B) What are thermoplastics and thermo setting plastic? Write any four differences between these two plastics. **(CO4)**

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**Model Question Paper (C-20)**

**ENGINEERING CHEMISTRY & ENVIRONMENTAL STUDIES (104)**

**TIME: 3hrs** **Total Marks:80**

**PART-A**

**Instructions: (1) Answer all questions.** **3x10=30M**

**(2) Each question carries 3 marks.**

1. Draw the shapes of s and p orbitals. **(CO1)**
2. Define mole. Find the mole number of 10 g of $CaCO_3$ **(CO1)**
3. Define Buffer solution. Give any two examples. **(CO1)**
4. Define chemical equivalent and electrochemical equivalent. Give their relation. **(CO2)**
5. State name of the salts and their formulae that cause hardness. **(CO3)**
6. Write any three disadvantages of using plastics. **(CO4)**
7. Classify the fuels based on their occurrence. **(CO4)**
8. Mention the basic chemical composition and applications of vinegar. **(CO4)**
9. List out any three threats to biodiversity. **(CO5)**
10. Define pollutant and contaminant. Give an example each. **(CO5)**

**PART – B**

**Instructions : Each question carries eight marks.** **8x5=40M**

11. A) Explain Bhor's atomic theory and give its limitations. **(CO1)**

(OR)

B) Explain ionic bond formation and covalent bond formation with one example each **(CO1)**

12. A) Calculate the molarity and normality of 250 ml of sodium carbonate solution that contains 10.6 gm of sodium carbonate. **(CO1)**

(OR)

B) Explain Bronstead and Lowry theory of acids and bases. Give its limitations. **(CO1)**

13. A) Explain froth floatation and electrolytic refining of copper with neat diagrams. **(CO1)**

(OR)

B) Explain the construction and working of galvanic cell. **(CO2)**

14. A) Explain Cathode protection methods. **(CO2)**

(OR)

B) Explain ion-exchange of softening of hard water with a neat diagram. **(CO3)**

15. A) Explain addition and condensation polymerisation with an example each .**(CO4)**

(OR)

B) Explain the causes and effects of air pollution. **(CO5)**

**PART –C**

**Question carries ten marks** **10x1 =10M**

16. Analyse the products formed at cathode and anode with electrode reactions during the Electrolysis of aqueous NaCl in compare with fused NaCl. **(CO2)**

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## ENGINEERING MECHANICS

| Course Code | Course Title | No. of Periods per Week | Total No. of Periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-105 | ENGINEERING MECHANICS | 05 | 150 | 20 | 80 |

| S.No. | Chapter/Unit Title | No. of Periods | COs Mapped |
|---|---|---|---|
| 1 | Introduction | 4 | CO1 |
| 2 | Forces & Moments | 18 | CO1 |
| 3 | Centroid | 18 | CO2 |
| 4 | Moment of Inertia | 30 | CO2 |
| 5 | Simple Stresses and Strains | 40 | CO3 |
| 6 | Shear force and Bending Moment | 40 | CO4 |
| | Total | 150 | |

**COURSE OBJECTIVES:**

| Upon completion of the course the student shall be able to | | |
|---|---|---|
| **Course Objectives** | (i) | Familiarize with the concepts of forces and their types, applications of forces and moments, calculate the geometric properties like Centroid and moment of inertia... etc., for various sections |
| | (ii) | Acquire the concepts of simple stresses and strains and their applications, and their relevance to mechanical properties of metals |
| | (iii) | Understand the effect of loading on beams, analyses Shear Force and Bending Moment of simple beams |

**COURSE OUTCOMES:**

| | | | |
|---|---|---|---|
| **Course Outcomes** | CO 1 | C 105.1 | Explain the basic concepts of Engineering Mechanics and concept of different forces & moments and applying these principles for Civil Engineering problems. |

| | | | |
|---|---|---|---|
| | CO 2 | C 105.2 | Compute the Centroid, Centre of gravity, Moment of Inertia and Radius of gyration for various sections |
| | CO 3 | C 105.3 | Calculate the simple Stresses and Strains in structural materials |
| | CO4 | C 105.4 | Explain concepts of shear force and bending moments, Compute the SF, BM values and Draws the SFD and BMD for beams. |

**LEARNING OUTCOMES:**

| | |
|---|---|
| **Learning Outcomes** | **1.0 Introduction**<br>1.1 Define Mechanics and Engineering Mechanics<br>1.2 State the applications of Engineering Mechanics<br>1.3 State the branches of Engineering Mechanics<br>1.3 Define the terms 1.Statics, 2.Dynamics, 3.Kinetics and 4.Kinematics<br>1.4 List the systems of measurements and Units<br>1.5 List S.I and M.K.S units of physical quantities used in Civil Engineering<br>**2.0 Forces and Moments**<br>2.1 Define the following terms:<br>1. Force<br>2. Moment<br>3. Resultant<br>4. Equilibrium of forces<br>5. Equilibrant<br>6. Moment of a couple<br>2.2 Distinguish between<br>2.2.1 Scalar and Vector quantities<br>2.2.2 Co-planar and non-co-planar forces<br>2.2.3 Parallel and non-parallel forces<br>2.2.4 Like and unlike parallel forces<br>2.3 Compute the resultant of two co-planar forces acting at a point by<br>2.3.1 Law of parallelogram of forces and<br>2.3.2 Triangle law of forces<br>2.4 Explain 'Lami's Theorem' and 'Polygon Law of forces'<br>2.41 Solve simple problems using Lami's Theorem<br>2.5 Explain 'Polygon Law of forces'<br>2.5.1 Compute the resultant of a system of coplanar concurrent forces by Polygon Law of forces<br>2.5.2 Define 'Resolution of forces'<br>2.6. Solve problems on computation of the resultant of a system of coplanar parallel forces.<br>2.7. Explain the properties of a couple. |

| | |
|---|---|
| | 2.8. List the conditions of equilibrium of rigid body subjected to a number of co- planar forces.<br>2.8.1. Calculate resultant of co-planar concurrent forces by analytical methods.<br>2.9 List various types of supports like Simple support, fixed support, hinged support, roller support, List various types of beams like simply supported beams, cantilever beams, fixed beams, over hanging beams, continuous beams.<br>2.10 List various types of loads like point load, uniformly distributed load, uniformly varying load, Calculate the support reactions for simply supported beams with point loads and uniformly distributed loading<br>**3.0 Centroid**<br>3.1 Define Centroid and Centre of gravity<br>3.2 Distinguish between Centroid and Centre of gravity<br>3.3 State the need for finding the Centroid and Centre of gravity for various engineering applications.<br>3.4 Calculate the positions of Centroid for simple plane figures from first principles<br>3.5 Explain the method of determining the Centroid by 'Method of moments'.<br>3.6 Calculate the position of Centroid of standard Sections-T, L, I, Channel section, Z section, unsymmetrical I section<br>3.7 Calculate the position of Centroid of built up sections consisting of RSJ's and flange plates and Plane figures having hollow portions<br>**4.0. Moment of Inertia**<br>4.1 Define Moment of Inertia, Polar Moment of Inertia and Radius of gyration<br>4.2 State the necessity of finding Moment of Inertia for various engineering applications<br>4.3 Compute Moment of Inertia and Radius of gyration for regular geometrical sections like T, L, I, Channel section, Z section and unsymmetrical I section<br>4.4 State 1. Parallel axes theorem and 2. Perpendicular axes theorem to determine Moment of Inertia<br>4.5 Compute MI of standard sections by applying parallel axis theorem.<br>4.6 Compute MI of built-up sections by applying parallel axis theorem.<br>4.7 Calculate radius of gyration of standard sections.<br>4.8 Compute Polar Moment of Inertia for solid and hollow circular Section by applying perpendicular axes theorem.<br>**5.0. Simple Stresses and Strains**<br>5.1 Define the following terms:<br>1. Stress |

| | |
|---|---|
| | 2. Strain<br>3. Modulus of Elasticity<br>4. Longitudinal Strain<br>5. Lateral Strain<br>6. Poisson's ratio<br>7. Modulus of rigidity<br>8. Bulk Modulus<br>9. working stress,<br>10. Factor of safety<br>11. Resilience<br>12. Strain Energy<br>13. Proof resilience<br>14. Modulus of Resilience<br>5.2 Distinguish between different kinds of stresses and strains<br>5.3 Draw the stress-strain curve for ductile materials (Mild steel) and Henceexplain the salient points on the curve.<br>5.4 State Hooke's law and limits of proportionality, State the factors affecting factor of safety<br>5.5 Solve problems on relationship between simple stress and simple strain under axial loading on uniform bars and stepped bars.<br>5.6 State the relationship among the elastic constants, Solve problems on relationship between elastic constants.<br>5.7 Calculate stresses in simple and composite members under axial loading<br>5.8 Define temperature stress, strain, hoops stress, Explain the concept of temperature stresses in composite sections.<br>5.9 Calculate instantaneous stress and strain Energy due to dynamic loads and impact loading.<br>5.10List and explain mechanical properties of materials<br>**6.0 Shear force and Bending moment**<br>6.1 Define<br>a) Cantilever beam<br>b) Simply supported beam<br>c) Fixed beam<br>d) Continuous beam<br>e) Overhanging beam<br>Define<br>a) Point Load<br>b) Uniformly Distributed Load<br>Describe<br>a) Roller support<br>b) Hinged support<br>c) Fixed support |

| | |
|---|---|
| | 6.2 Calculate reactions at rollers/hinged and fixed supportsfor<br>1. Simply Supported beams,<br>2. Cantilever beams and<br>3. Overhanging beams.<br>6.3 Explain a)Shear Force and b) Bending Moment<br>6.4 Explain sign conventions used for drawing 1. Shear Force and2. Bending Moment<br>6.5 Deduce the relationship among the rate of loading, shear force and bending moment<br>6.6 Determine Shear Force and Bending Moments on Cantilever and Simply Supported beams for simple cases of loading (Point Load, Uniformly Distributed Load) analytically<br>6.7 Describe the procedures for sketching the Shear Force Diagrams (SFD) and Bending Moment Diagrams (BMD)<br>6.8 Sketch Shear Force Diagrams (SFD) and Bending Moment Diagrams (BMD) for Cantilever and Simply Supported Beams<br>6.9 Define point of contra flexure<br>6.10 Determine the Shear Force, Bending Moment and point of contraflexure for overhanging beams and sketch Shear Force Diagrams (SFD) and Bending Moment Diagrams(BMD) for overhanging beams |

**PO-CO MAPPING:**

| **C-105** | **ENGINEERING MECHANICS**<br>**No. of COs: 04** | | | | **No. of Periods: 150** |
|---|---|---|---|---|---|
| **POs** | **Mapped with CO Nos.** | **CO periods addressing PO in Col.1** | | **Level (1,2,3)** | **Remarks** |
| | | **No.** | **%** | | |
| 1 | CO1, CO2, CO3, CO4 | 55 | 37 | 2 | >40% Level.3 (Highly addressed)<br>25% - 40% Level.2 (Moderately addressed<br>5% - 25% Level.1 (Low addressed)<br><5% Not addressed |
| 2 | CO1, CO2, CO3, CO4 | 65 | 43 | 3 | |
| 3 | CO1, CO2, CO3, CO4 | 20 | 13 | 1 | |
| 4 | CO2 | 10 | 07 | 1 | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |

**CO-PO MAPPING:**

| CO No. | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | 2 | | | | | 2 | 3 | 1 |
| **CO2** | 2 | 2 | 2 | 1 | | | | 2 | 3 | 1 |
| **CO3** | 3 | 3 | 3 | | | | | 2 | 3 | 1 |
| **CO4** | 3 | 3 | 2 | | | | | 2 | 3 | 1 |
| **Average** | 2.5 | 2.5 | 2.25 | 1 | | | | 2 | 3 | 1 |

**Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**

**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc**

**COURSE CONTENT:**

**1. Introduction**

Mechanics-Engineering Mechanics-Applications and branches of Engineering Mechanics - Statics, Dynamics, Kinetics and Kinematics - Systems of measurements and Units - S.I and M.K.S units of physical quantities used in Civil Engineering

**2. Forces & Moments**

Definition of force - Vectors and Scalars - Vector representation of a force - systems of forces - Co-planar forces - Resultant of forces at a point – Parallelogram Law and Triangle Law of forces – Lami's theorem – Polygon law of forces – Resolution of forces- Parallel forces – like and unlike forces – moment of a force - units and sense-couple-moment of a couple – properties of a couple - Conditions of equilibrium of a rigid body subjected to a number of co-planar forces - Structural members supporting co-planar forces - Types of supports- Types of beams - Types of loading- Determination of support reactions for simply supported beams with point loads and Uniformly distributed loading.

**3. Centroid**

Definitions – Centroid - Centre of gravity - Position of Centroid of standard figures like rectangle, triangle, parallelogram circle, semi-circle and trapezium - Determination of location of Centroid of standard sections - T, L, I, Channel section, Z section and built up sections consisting of RSJs and flange plates and plane figures having hollow portion.

**4. Moment of Inertia**

Definition of Moment of Inertia - Perpendicular and parallel axes theorems –

Moment of Inertia of standard sections like rectangle, triangle, circle and hallow

circular sections - Moment of Inertia of built up sections- T, L, I, Channel section and Z sections using parallel axis theorem - Moment of Inertia and radius of gyration of built-up sections consisting of the combinations of RSJ's flange plates, channels & flange plates etc - Polar Moment of Inertia of solid and hallow circular sections using Perpendicular axis theorem

**5. Simple Stresses and Strains**

Stress and strain – type of stresses and strains - Stress strain curves for ductile materials- mild steel, elastic limit, limit of proportionality, yield point, ultimate stress; breaking stress; working stress, factor of safety – Factors affecting factor of safety - Hooke's law – Young's modulus – deformation under axial load - Shear stress and Shear Strain – Modulus of rigidity - Longitudinal and lateral strain - Poisson's ratio - Bulk Modulus – relationship between elastic constants (Proof not required, only problems) - Composite sections – Effect of axial loads - Temperature stresses – strains – Hoop stress - Temperature stresses in composite sections - Resilience – strain energy-proof resilience and modulus of resilience – maximum instantaneous stress due to gradual, sudden and shock loading - Mechanical properties of materials-elasticity, plasticity, ductility, brittleness, malleability, stiffness, hardness, toughness, creep, fatigue, examples of materials which exhibit the above properties.

**6.0 Shear force and bending Moment**

Beams – Types of beams – Cantilevers – Simply supported – Overhanging – Fixed and continuous -Types of supports – Roller – Hinged – Fixed - explanation of S.F and B.M. at a section- Relation between rate of loading SF and BM - Calculation of S.F. and B.M values at different sections for cantilevers Simply supported beams - overhanging beams under point loads and uniformly distributed loads, position and significance of points of contra flexure - Drawing S.F. and B.M diagrams by analytical methods – location of points of contra flexure.

**REFERENCE BOOKS:**


1. Engineering Mechanics,N. H. Dubey, Tata McGraw Hill
2. Engineering Mechanics,R.S. Kurmi,S.Chand and Company Limited
3. Engineering Mechanics,R.K.Singal,M.Singal, R.SingalI.K.International
4. Engineering Mechanics-Statics,P.Dayaratnam, Tata McGraw Hill

**MODEL BLUE PRINT**

| S. No | Chapter Title | No. of periods | Weigh-tage Allocated | Marks wise Distribution of Weightage | | | | Question wise Distribution of Weightage | | | | Linked with CO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | R | U | Ap | An | R | U | Ap | An | |
| 1. | Introduction | 4 | 03 | 03 | -- | -- | -- | 1 | - | - | -- | CO1 |
| 2. | Forces & Moments | 18 | 14 | 03 | 03 | 08 | -- | 1 | 1 | 1 | -- | CO1 |
| 3. | Centroid | 18 | 11 | 03 | -- | 08 | -- | 1 | -- | 1 | -- | CO2 |
| 4. | Moment of Inertia | 30 | 11 | 03 | -- | 08 | -- | 1 | -- | 1 | -- | CO2 |
| 5. | Simple Stresses and Strains | 40 | 17 | 03 | 06 | 08 | -- | 1 | 2 | 1 | -- | CO3 |
| 6 | Shear force and Bending moment | 40 | 14 | 03 | 03 | 08 | --- | 1 | 1 | 1 | -- | CO4 |
| | **Higher order question from any or combination of 5 & 6 Chapters** | -- | 10 | -- | -- | -- | 10 | -- | -- | -- | 1 | CO3 &CO 4 |
| | **Total** | **150** | **80** | **18** | **12** | **40** | **10** | **6** | **4** | **5** | **1** | |

**Table specifying the scope of syllabus to be covered for Unit Test-I,Unit Test-II& Unit Test - III**

| Unit Test | Learning outcomes to be covered |
|---|---|
| Unit Test-I | From 1.1 to 3.7 |
| Unit Test-II | From 4.1 to 5.5 |
| Unit Test –III | From 5.6 to 6.10 |

**Model Paper for Unit Test-I:**

**State Board of Technical Education and Training, A.P.**

**Diploma in Civil Engineering (DCE)**

**First Year : C-105 ENGINEERING MECHANICS**

**Time: 90 Minutes** **Unit Test –I** **Maximum Marks: 40**

**PART- A** **16 Marks**

**Instructions:**

**(i) Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1. (a) _____ & Dynamics are the branches of Engineering Mechanics (CO1)

   (b) The forces, which are lying in the same plane, are called as _____ forces (CO1)

   (c) The centroid of a semi-circle with radius 'r' lies at a distance of _____from the base (CO2)

   (d) The cycle pedal is the example for a Collinear force (True/False) (CO1)

2. State the (i) Parallelogram law of forces (ii) Lami's Theorem

3. Two forces act at an angle of 120°. The bigger force is 60 kN and the resultant is perpendicular to the smaller one. Find the smaller force. (CO1)

4. State the need for finding the centroid and centre of gravity for various engineering Applications (CO2).

5. Determine the centre of gravity of the remaining portion of a circular sheet metal of radius 50 mm, when a hole of 25 mm radius of circle is cut from the right side horizontal axis of the 50 mm radius circle (CO2)

**PART- B** **3 x 8 = 24 Marks**

**Instructions:** **(i) Answer all questions**
**(ii) Each question carries EIGHT marks**
**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A) Find the magnitude and direction of resultant force for following forces acting at a point
   (a) 30 KN due S
   (b) 25 KN due N-E
   (c) 62 KN due W
   (d) 80 KN at $60^0$ E of S and
   (e) 70 KN at $40^0$ S of W (CO1)

**(OR)**

(B) Four forces acting at a point are in equilibrium. Three of them are: 200N due S, 400N due N-E, and 500N at $30^0$ east of south. Find analytically the magnitude and direction of the Fourth force. (CO1)

7. (A) A body of weight 1000 N is suspended by two strings of 4 meters and 3 meters lengths attached at the same horizontal level 5 meters apart. Calculate the forces in the strings. (CO1)

(OR)

(B) Five forces 20N, 30N, 40N, 50N and 60N are acting on one of the angular points of a regular hexagon towards the other five angular point taken in order. Find the magnitude and direction of the resultant force. (CO1)

8. (A) A masonry dam is trapezoidal in section with one face vertical. The top width is a m, bottomwidth is b m and the height is h m. Find the position of centroid from the vertical face of the dam. (CO2)

(OR)

(B) Find the C.G. of an I-section with top flange 100mmX20mm, web 30mmX200 mm and bottom flange 300mmX40mm (CO2)

***

**Model Paper for Unit Test-II:**

**State Board of Technical Education and Training, A.P.**

**Diploma in Civil Engineering (DCE)**

**First Year : C-105 ENGINEERING MECHANICS**

**Time: 90 Minutes** **Unit Test –II** **Maximum Marks: 40**

**PART- A** **16 Marks**

**Instructions: (i) Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1. (a) The second moment of an area is called _____ (CO2)

   (b) The formula for moment of inertia of a triangle about its base is _____ (CO2)

   (c) The stress is directly proportional to the strain within _____limit (CO3)

   (d) The ratio between linear strain and lateral strain is called_____ (CO3)

2. The moment of inertia of a square about its base is 900 $mm^4$. Find the values of Ixx, Iyy and Izz for the square. (CO2)
3. Define the terms Young's Modulus and Shear modulus (CO3)
4. Draw Stress-Strain Curve for Mild Steel specimen and indicate salient points (CO3)
5. Write any three relationships among elastic constants. (CO3)

**PART- B** **3 x 8 = 24 Marks**

**Instructions: (i) Answer all questions**

**(ii) Each question carries EIGHT marks**

**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6.(A) Find the Moment of Inertia of an angular section 350 x 250 x 16 mm with its long leg vertical. (CO2)

**(OR)**

(B) Determine the moment of inertia about the centroidal axes for a built - up section having four equal angle sections forming a box of size 180 mm. The single angle section is 90 mm × 90mm × 10mm. The properties of angle section A= 1047 $mm^2$; $I_{xx} = I_{yy} = 8.1 \times 105\ mm^4$, $C_{xx} = C_{yy} = 24.2$ mm (CO2)

7.(A) A steel flat of 400mm length, 80mm width and 15mm thickness is subjected to an axial compression of 150 KN. The young's modulus of steel is 2 x 105 $N/mm^2$ and Poisson's ratio is 0.3. Determine change in length, width and volume of flat. (CO3)

(OR)

(B) A round bar400 $mm^2$ in cross sectional area and 100 mm in length is subjected to an axial thrust of 80 kN.If the length of the bar is decreased by 0.17 mm and its diameter increases by 0.01 mm. Determine the Poisson's ratio and three elastic moduli for the material of the bar. (CO3)

8. (A) Two channels ISLC 400 are to be placed back to back so that $I_{XX}$ and $I_{YY}$ of sections are equal. Determine the clear distance between back of the channels. For each channels $I_{XX}$ =1.4 x$10^8$ $mm^4$ , $I_{YY}$ = 4.6 x $10^6$ $mm^4$ , A = 5800 $mm^2$ , $C_{YY}$ = 30 mm. (CO3)

(OR)

(B) A bar of 25 mm diameter and 600 mm long is subjected to a pull of 50 kN. The change in diameter and length was observed to be 0.03 mm and 0·30 mm. Calculate (a) Young's modulus, (b) Poission's ratio, (c) Modulus of rigidity and (d) Factor of safety if ultimate stress = 204 N/$mm^2$ . (CO3)

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**Model Paper for Unit Test-III:**

**State Board of Technical Education and Training, A.P.**

**Diploma in Civil Engineering (DCE)**

**First Year : C-105 ENGINEERING MECHANICS**

**Time: 90 Minutes** **Unit Test –III** **Maximum Marks: 40**

**PART- A** **16 Marks**

**Instructions: (i) Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1. (i) The bending moment at the point of contra flexure is _____ (CO4)

   (ii) What is the bending moment at end supports of a simply supported beam?

   a) Maximum

   b) Minimum

   c) Zero

   d) Uniform (CO4)

   (iii) How do point loads and udl be represented in SFD?

a) Simple lines and curved lines

b) Curved lines and inclined lines

c) Simple lines and inclined lines

d) Cant represent any more (CO4)

(iv) The parallel axis theorem gives the moment of inertia _____ to the surface of consideration.

a) Linear

b) Non-Linear

c) Perpendicular

d) Parallel (CO3)

2. A wooden wheel of 2000 mm diameter is to be fitted with a steel ring of 1990 mm internal diameter. Determine (a) Stress developed in steel and (b) Minimum temperature required to fit the steel ring over wooden wheel. Take Young's modulus of steel as 2 × 105 N/ $mm^2$ and Co-efficient of thermal expansion as 12 × 10-6/$^0$C (CO3)

3. Write the relationship between rate of loading, shear force and bending moment. (CO4)
4. A simple supported beam of span 6 m carries a uniformly distributed load of 10 kN/m over the left-hand half of the span and a concentrated load of 20 kN at a distance of 1 m from the right-hand support. Find the reaction at the supports. (CO4)
5. A cantilever 4 meters long carries a uniformly distributed load of 8 kN/m over a length of 2·5 m from free end. Draw the shear force and bending moment diagrams for the above loading system. (CO4)

**PART- B** **3 x 8 = 24 Marks**

**Instructions:**

**(i) Answer all questions**

**(ii) Each question carries EIGHT marks**

**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A) A load of 80 kN is suddenly applied on a bar 4 m long and 1000 $mm^2$ in cross-section. Calculate the maximum instantaneous stress produced and strain energy stored in the bar if E = 200 GPa. (CO3)

(OR)

(B) An RCC column 500 mm × 450 mm in section is provided with 6 nos. of 40 mm diameter bars. The column carries an axial load of 600 kN. Find the stresses in concrete and steel and also calculate the loads shared by concrete and steel if m = 15. (CO3)

7.(A) A cantilever of length 4 m carries a point load of 5 kN at its free end and a u.d.l. of 2 kN/m over a length of 2 m from the fixed end. Draw the SF and BM diagrams indicating their maximum values. (CO4)

(OR)

(B) A uniform beam of 8 m length is supported at its left hand end and at 2 m from its right hand end. Three point loads of 180 kN, 50 kN and 30 kN are carried by the beam at 2 m, 4 m and 8 m from its left support respectively. Draw SF and BM diagrams and show the values at salient points. (CO4)

8. (A) A simply supported beam of span 8 meters carries a uniformly distributed load of 20 kN/m in the right half of the beam and a concentrated load of 40 kN at a distance of 2 m from left support. Draw the shear force and bending moment diagram. Also show the maximum bending moment . (CO4)

(OR)

(B) A beam of length 12 m is supported by two supports at 2 m from left end and another at 2m from right end. It carries a uniformly distributed load of 10 kN/m over its 12 m length. It is also loaded with a point load of 20 kN placed at 5 meters from left support and another point load of 4 kN placed at right face end. Draw the shear force diagram and bending moment diagram. Also determine the position and magnitudes of maximum hogging and sagging moments (CO4)

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**Model Paper for End Examination**

**MODEL PAPER – BOARD DIPLOMA EXAMINATION, (C–20)**

**DCE—FIRST YEAR EXAMINATION**

**ENGINEERING MECHANICS (C-105)**

Time: 3 hours] [Total Marks: 80

**PART—A** 3×10=30 Marks

***Instructions:*** **(1) Answer all questions.**

**(2) Each question carries three marks.**

**(3) Answers should be brief and straight to the point and shall not exceed *five* simple sentence**

1) Define the terms 1.Statics 2.Dynamics. (CO1)
2) State Parallelogram and triangle law of forces (CO1)
3) State the characteristics of couple. (CO1)
4) Distinguish between centriod and centre of gravity (CO2)
5) State and explain Parallel axis theorem (CO2)
6) Define the terms Young's Modulus and Modulus of Rigidity (CO3)
7) Draw Stress-Strain Curve for Mild Steel specimen and indicate salient points (CO3)
8) State elastic constants and write their relationship. (CO3)
9) Define the terms Shear Force and Bending Moment (CO4)
10) Obtain the expressions for maximum SF and BM for SS beam carrying UDL through its length. (CO4)

**PART – B** 8 x 5 = 40 marks

***Instructions :*****Answer either (a) or (b) from each questions from Part-B**

11) (A) Find the magnitude and direction of resultant force for following forces acting at a point
(a) 80 KN due N
(b) 20 KN due N-E
(c) 40 KN due E
(d) 60 KN at 600 E of S and
(e) 70 KN at 600 S of W (CO1)

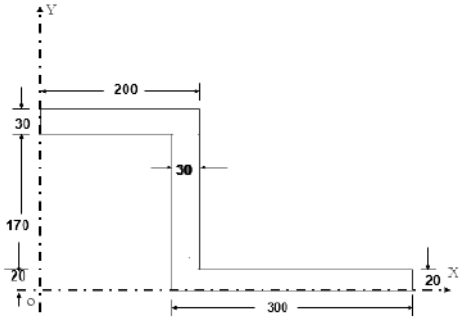
**(OR)**

(B) Four forces acting at a point are in equilibrium. Three of them are: 200N due S, 400N due N-E, and 500N at $30^0$ east of south. Find analytically the magnitude and direction of the fourth force. (CO1)

12) (A) Find the C.G. of an I-section with top flange 100mmX20mm, web 30mmX200 mm and bottom flange 300mmX40mm (CO2)

**(OR)**

(B) Locate the centre of gravity of given Z – section with reference to the axes OX and OY. (CO2)



13) (A) Two ISLC250 sections are placed back-to-back at a clear distance of 100 mm.Flange plates are attached at top and bottom.Each plate is 300 x 30 mm.For each channel section,Area = 3000 $mm^2$ ,Flange width = 100mm,IXX = 25.5 x 106 $mm^4$ ,IYY = 2.1 x $10^6$mm4 ,Distance of centroid from back of web = 25 mm ,Determine moment of inertia about centroidal axes. (CO2)

**(OR)**

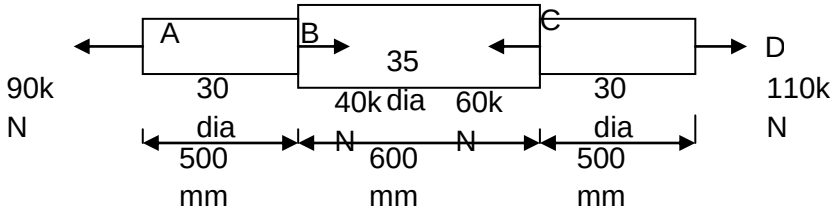
(B) Find the Moment of Inertia of an angular section 350 x 250 x 16 mm with its long leg vertical. (CO2)

14) (A) A steel flat of 500mm length, 60mm width and 20mm thickness is subjected to an axial compression of 168 KN. The young's modulus of steel is 2 x 105 N/$mm^2$ and Poisson's ratio is 0.3. Determine change in length, width and volume of flat. (CO3)

**(OR)**

(B) A steel bar 1.6 m long is acted upon by forces as shown in figure. Find the elongation of the bar. Given E = 200 G Pa. (CO3)

15) (A) A




cantilever 5m long carries three point loads of 20 kN, 30 kN at 1m, 2.5m and 4m respectively from free end . Draw S.F and B.M diagrams. Calculate S.F and B.M at 4.5 m from free end. (CO4)

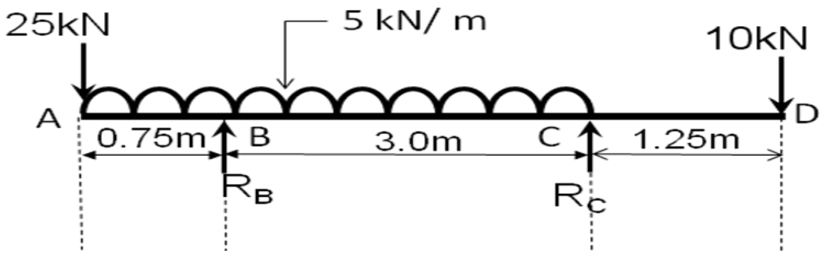
**(OR)**

(B) A beam of span 8m freely supported at its ends carries a UDL of 10kN/m over a length of 3m from the left hand support. It also carries another UDL of 15kN/m over a length of 2m from the right hand support in addition to a point load of 30kN at its mid span. Calculate the Maximum SF and BM and draw SFD and BMD. (CO4)

**PART – C**

**Question No.16 is compulsory and carries 10 marks** **10 x1 = 10 marks**

16) Determine the Shear Force and Bending Moment at salient locations of the overhanging beam shown in the figure and sketch the SFD & BMD. State the values of Maximum S.F. and B.M. Locate the Points of Contraflexure. (CO5)



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| Course Code | Course Title | No. of Periods per Week | Total No. of Periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-106 | SURVEYING-I | 03 | 90 | 20 | 80 |

| S. No. | Major Topics | No. of Periods | COs Mapped |
|---|---|---|---|
| 1. | Introduction to Surveying | 5 | **CO1** |
| 2. | Chain Surveying | 21 | **CO2** |
| 3. | Compass Surveying | 21 | **CO3** |
| 4. | Levelling | 40 | **CO4** |
| 5. | Minor Instruments | 03 | **CO5** |
| | **Total** | **90** | |

**COURSE OBJECTIVES:**

| Upon completion of the course the student shall be able to | | |
|---|---|---|
| **Course Objectives** | (i) | Acquire basic knowledge about principles of surveying for location, design and construction of engineering projects. |
| | (ii) | Develop skills in using basic surveying instruments like measuring chains, tapes, compass, levels & minor instruments |

**COURSE OUTCOMES:**

| | | | |
|---|---|---|---|
| **Course Outcomes** | CO1 | C-106.1 | State the fundamental principles of Surveying. |
| | CO2 | C-106.2 | Explain the principle of chain surveying and Perform the operations involved in chaining on flat and sloping grounds and when high ground intervenes, Practice chain triangulation/traversing for location survey. |
| | CO3 | C-106.3 | Describe the operations involved in field compass surveying like taking bearings and calculation of included angles & traversing. |
| | CO4 | C-106.4 | Explain the fundamental principles of levelling, tabulate the levelling field data, explain computation of reduced levels, different types of |

| | | | |
|---|---|---|---|
| | | | levelling, errors involved in levelling and contours. |
| | CO5 | C-106.5 | List the various minor instruments used in surveying and their uses. |

**LEARNING OUTCOMES:**

| | |
|---|---|
| **Learning Outcomes** | **1. 0 Introduction to surveying**<br>1.1 State the concept of surveying.<br>1.2 State the purpose of surveying.<br>1.3 Distinguish between 1. Plane and 2. Geodetic surveying.<br>1.4 State the units of linear and angular measurements in Surveying and conversions.<br>1.5 List the instruments used for taking linear and angular measurements.<br>1.6 Classify different types of surveys.<br>1.7 State the fundamental principles of surveying.<br>1.8 State and explain different stages of survey operations.<br><br>**2.0 Chain Surveying**<br>2.1 State the purpose and principle of Chain surveying and explain the principles used in Chain triangulation.<br>2.2 List different instruments used in Chain Surveying and explain their functions.<br>2.3 List the six points to be followed while selecting the survey stations<br>2.4 Define ranging and explain methods of ranging a line.<br>2.5 List the all operations involved in chaining on 1. Flat ground 2. Sloping ground and 3. When high ground intervenes.<br>2.6 Describe in detail the method of setting out right angles, explain Field work procedure in Chain survey and Method of recording field observations<br>2.7 List the errors and mistakes in Chain surveying and apply the corrections for measurement due to incorrect length of chain<br>2.8 Explain the methods of overcoming different obstacles in chain surveying.<br>2.9 Explain the methods of preparing site plans by Chain Surveying.<br>2.10 Calculate the areas of irregular boundaries using Average Ordinate rule, Trapezoidal rule and Simpson's rule.<br>**3.0 Compass Surveying**<br>3.1 State the purpose and principles of Compass surveying.<br>3.2 Identify the parts of Prismatic Compass and state their functions<br>3.3 Define -Whole Circle Bearing, Quadrantal Bearing, True meridian, Magnetic meridian, True bearing, Magnetic bearing, Dip, Declination and Local attraction.<br>3.4 Convert Whole Circle Bearing in to Quadrantal Bearing and vice versa. |

| | |
|---|---|
| | 3.5 Explain local attraction and its effects.<br>3.6 Compute the included angles of lines in a Compass traverse and the true bearings of lines in a Compass traverse.<br>3.7 Explain the operations involved in field in compass Surveying.<br>3.8 Explain methods of recording field notes and plotting Compass Surveying.<br>3.9 Explain the method of plotting closed traverse adjusting closing error by Bowditch rule.<br>3.10 Explain errors in Compass surveying.<br>**4.0 Levelling**<br>4.1 Define levelling and List the types of levelling instruments, Define the terms -Datum or Datum plane, Reduced level, Level surface, Horizontal surface, Vertical Line and Station, Mean sea level ,Bench Mark<br>4.2 List the component parts of a dumpy level and their functions, explain the steps involved in temporary adjustments of a dumpy level, Define Back sight, Fore sight, Intermediate sight, Change Point.<br>4.3 List different types of levelling staves, tabulate the levelling field data, state methods of reducing levels, Compare height of instrument and Rise and fall methods, Compute reduced levels by height of instrument and Rise and fall methods, and apply check.<br>4.4 List the different types of Levelling, Describe in detail Profile levelling and Reciprocal levelling<br>4.5 State the Errors in levelling and the Precautions to be taken to prevent errors in levelling, Explain the effect of Errors due to Curvature and Refraction, Compute the error due to Curvature, Refraction and Combined error and apply correction to be applied for the above errors<br>4.6 List the errors eliminated in reciprocal levelling, Derive the formula for true difference in elevation and true error between two points, Calculate true difference in elevation and collimation error in reciprocal levelling<br>4.7 List the fundamental lines of dumpy level and state the relationship among fundamental lines of dumpy level<br>4.8 Explain permanent adjustments of a dumpy level (Two peg method without problems)<br>4.9 Define Contour, Contour interval and Horizontal equivalent, List the Characteristics and uses of contours, explain different methods of contouring and interpolation of contours<br>4.10 Explain the method of tracing contour gradient / alignment of hill road<br>**5.0 Minor Instruments**<br>5.1 Explain the need for using Minor instruments |

| | |
|---|---|
| | 5.2 List various minor instruments used in surveying<br>5.3 Explain the uses of the following minor instruments:<br>1. Abney Level, 2. Pentagraph and 3. Electronic Planimeter |

**PO-CO Mapping:**

| **Course Code : C-106** | **Course Title: Surveying – I**<br>**Number of COs: 05** | | | | **No. of Periods: 90** |
|---|---|---|---|---|---|
| **POs** | **Mapped with CO Nos** | **CO Periods addressing PO in Col. 1** | | **Level (1,2,3)** | **Remarks** |
| | | **No** | **%** | | |
| PO1 | CO1, CO2, CO3, CO4, CO5 | 42 | 47 | 3 | > 40% Level 3 Highly addressed<br>25% to 40% Level 2 Moderately addressed<br>5 to 25% Level 1 Low addressed |
| PO2 | CO2,C03,CO4 | 31 | 34 | 2 | |
| PO3 | | | | | |
| PO4 | CO2, CO4 | 12 | 13 | 1 | |
| PO5 | CO2 | 5 | 6 | 1 | |
| PO6 | | | | | |
| PO7 | | | | | |

**CO-PO Mapping:**

| CO No. | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | | | | | | | 2 | 3 | 2 |
| CO2 | 2 | 2 | | 2 | 2 | | | 2 | 3 | 2 |
| CO3 | 3 | 3 | | | | | | 2 | 3 | 2 |
| CO4 | 3 | 3 | | 2 | | | | 2 | 3 | 2 |
| CO5 | 3 | | | | | | | 2 | 3 | 2 |
| **Average** | **2.6** | **2.67** | | **2** | **2** | | | **2** | **3** | **2** |

**Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**

**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc**

**COURSE CONTENT:**

**1.0 Classification and Principles of Surveying**

Definition-Concept of Surveying-purpose of Surveying-Divisions of surveying- Classification of Surveying based on different criteria– Fundamental principles in Surveying -

Measurements- Units and conversions-Instruments used for taking linear and angular measurements- Stages of survey operations-Field work, Office work, Care and adjustments of the instruments.

**2.0 Chain Surveying**

Purpose and Principle of Chain Surveying -Suitability of Chain Surveying-Survey stations and their selection-Survey lines and offsets – Instruments used in Chain survey and their function - Ranging a survey line- direct ranging and Indirect ranging –Chaining a line –Duties of leader and follower- Chaining on a sloping ground-Errors and mistakes in ordinary chaining - Correction due to incorrect length of Chain- problems -Different operations in Chain Surveying- Setting out right angles with cross staff and Optical square- Cross staff survey Field work procedure- Recording field notes – field book -Conventional signs - Obstacles in chain survey -methods to overcome obstacles-Problems Calculations of area – different methods – Average ordinate, Trapezoidal and Simpson's rules.

**3.0 Compass Surveying**

Introduction, Purpose, principle and uses of compass Survey-Traverse-Open and Closed Traverse –Theory of magnetism-Description working and use of Prismatic compass-Operations in using Compass before taking readings - Concept of Meridian-Types of meridians-Bearing and angle- Designation of bearings- Whole Circle Bearing. Quadrantal Bearing Conversions-Field work in Compass Survey –field notes-traverse using prismatic compass -Local attraction-detection and correction, Dip and Magnetic declination- Variation of Magnetic declination -calculation of true bearings-Determination of included angles from the given bearings and vice versa in compass traverse - Plotting of closed traverse-closing error and adjustments by Bowditch graphical method - Precautions in using a Compass-Errors in Compass Surveying.

**4.0 Levelling**

Levelling – Types of levelling instruments – component parts of a dumpy level and their functions – Definitions of important terms used in Levelling – level surface, level line, plumb line, horizontal line, axis of telescope, line of collimation, back sight, fore sight, intermediate sight, station and change point – Temporary adjustments of a dumpy level – types of Levelling Staves - Bench marks – different types of bench marks - Booking of readings in field book – Determination of Reduced levels by height of instrument and Rise and Fall methods – Comparison of methods – Problems-Missing Entry - Calculations-Problems - Classification of Levelling – detailed description of profile levelling and reciprocal levelling – Problems on Reciprocal levelling - Errors due to curvature and refraction and combined correction – problems - Contouring – contour, contour interval and horizontal equivalent – Characteristics of contours – methods of contouring – Block contouring – Radial contouring – interpolation of contours – uses of Contour maps – tracing of contour gradient or alignment of a hill road – Marking alignment of roads, railways and canals - Fundamental lines of dumpy level and their relations – Permanent adjustments of a dumpy level (Two peg method without problems)

**5.0 Minor instruments**

Purpose of Minor instruments- Various minor instruments- Uses of Abney Level, Pentagraph and Electronic Planimeter .

**REFERENCE BOOKS :**

1) Surveying - I &II,Dr.B.C. Punmia,Lakshmi Publications Pvt Ltd

2) Surveying-I &II,Dr.K.R.Arora,Standard Book House
3) Surveying and levelling - I & II,T.P Kanetkar&S.V.Kulakarni,Pune VidhyardhiGrihaPrakasan`
4) Text book of surveying, Dr.C.Venktramaiah,Universities Press
5) Surveying& Levelling,N.N.Basak,TMH

**MODEL BLUE PRINT**

| S. No. | Chapter name | Periods allocated | Weightage of Marks allotted | Marks wise distribution of weightage | | | | Periods wise distribution of weightage | | | | CO'S MAPPED |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | R | U | Ap | An | R | U | Ap | An | |
| 1 | Introduction to surveying | 5 | 11 | 3 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | CO1 |
| 2 | Chain Surveying | 21 | 17 | 3 | 3 | 16 | 0 | 1 | 1 | 2 | 0 | C02 |
| 3 | Compass Surveying | 21 | 25 | 3 | 3 | 8 | 0 | 1 | 1 | 1 | 0 | CO3 |
| 4 | Levelling | 40 | 14 | 6 | 6 | 16 | 0 | 2 | 2 | 2 | 0 | CO4 |
| 5 | Minor Instruments | 03 | 3 | 3 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | CO5 |
| NOTE: HIGHER ORDER QUESTION FROM ANY OR COMBINATION UNITS 2,3,4 | | | 10 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 1 | CO2, CO3, CO4 |
| **TOTAL** | | | **80** | **18** | **12** | **40** | **10** | **6** | **4** | **5** | **1** | |

**R-remember U-Understanding Ap-Application An-Analysing**

**Table specifying the scope of syllabus to be covered for Unit Test-I,Unit Test-II & Unit Test -III**

| Unit Test | Learning Outcomes to be covered |
|---|---|
| Unit Test – I | From 1.1 to 2.10 |

| | |
|---|---|
| Unit Test – II | From 3.1 to 4.3 |
| Unit Test – III | From 4.4 to 5.3 |

**Model Paper for Unit Test-I :**
**State Board of Technical Education and Training, A.P.**
**Diploma in Civil Engineering (DCE)**
**First Year :C-106 SURVEYING-I**

**Time: 90 Minutes** **Unit Test –I** **Maximum Marks : 40**

**PART- A** **16 Marks**

**Instructions :**

**(i) Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1.(a) Marine survey deals with water bodies for the purpose of navigation, water supply, harbour works etc. (TRUE/FALSE) (CO1)

(b) Number of links in 30 m metric chain is _____ (CO2)

(c) Optical square is used to establish_____ (CO2)

(d) The method performed to set out perpendicular using chain alone is_____ (CO2)

2. State fundamental principles of surveying. (CO1)

3. Define plane surveying and Geodetic surveying. (CO1)

4. Define Base line, check line and Tie line. (CO2)

5. What are the instruments used in chain surveying. (CO2)

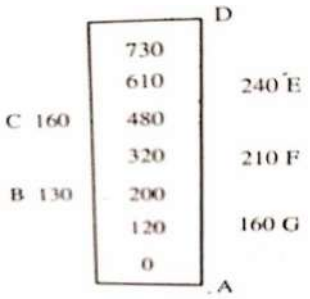
**PART- B** **3 x 8 = 24 Marks**

**Instructions :(i) Answer all questions**

**(ii) Each question carries EIGHT marks**

**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A) Plot the following cross staff survey of a field ABCDEFG and calculate its area in hectares. (CO2)




(OR)

(B) Explain with sketches the method of direct and indirect ranging.. (CO2)

7. (A) A chain was tested before starting the survey and was found to be 20m. At the end of the survey it was tested again and found to be 20.12m. Area of the plan of the field drawn to a scale of 10mm=6m, was 5040sqm. Find the true area of the field in Square meters.(CO2)

(OR)

(B) A survey line ABDE intersects a building between B and D. To overcome the obstacle a perpendicular BC 90m long, is set out at B. From C, two lines CD and CE are set out at angles $45^{o}$ and$60^{o}$ respectively with CB. Find the lengths CD and CE such that points D and E fall on the prolongation of line AB. Also find the obstructed distance BD. (CO2)

8. (A) The following perpendicular offsets were taken from a survey to a hedge. (CO2)

| Distance (m) | 0 | 5 | 10 | 15 | 20 | 30 | 40 | 55 | 70 |
|---|---|---|---|---|---|---|---|---|---|
| Offset (m) | 3.29 | 4.05 | 6.23 | 5.75 | 4.76 | 5.26 | 4.32 | 3.92 | 2.91 |

Find the area between the survey line and the hedge by Trapezoidal rule and Simpsons rule.

(OR)

(B) What are the types of obstacle in chaining? Explain by any two methods how chaining is continued when a river comes across a chain line. (CO2)

-OOo-

**Model Paper for Unit Test-II:**

**State Board of Technical Education and Training, A.P.**

**Diploma in Civil Engineering (DCE)**

**First Year :C-106 SURVEYING-I**

**Time: 90 Minutes** **Unit Test –II** **Maximum Marks : 40**

**PART- A** **16 Marks**

**Instructions :(i) Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1. (a) Whole circle bearing of a line is 354°30'then Quadrantal bearing is _____ (CO3)
   (b) Line joining points of same declination is called_____ (CO3)
   (c) The arithmetical check formula in the case of Height of Instrument method of reduction of levels is _____ (CO4)
   (d) The readings taken on a staff at which instrument shifted is called_____ (CO4)
2. Calculate back bearings for the following fore bearing of the lines. (CO3)
   (i) 310°30' (ii) 145°15' (iii) 210°30'
3. Convert following Quadrantal bearings into whole circle bearings: (CO3)
   (i) N 45°15' E (ii) S 45°20' E (iii) S 10°45' W
4. Define the following terms: (CO4)
   (i) Back sight (ii) Fore sight (iii) Change point
5. Define (i) Level surface (ii) Datum. (CO4)

**PART- B** **3 x 8 = 24 Marks**

***Instructions :*** **(i) Answer all questions**

**(ii) Each question carries EIGHT marks**

**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A) Draw the neat sketch of prismatic compass and explain the function of parts. (CO3)

(OR)

(B) The bearings of the sides of the traverse ABCDEA are given below. Sketch and compute interior angles of the traverse. (CO3)

| Line | FB | BB |
|---|---|---|
| AB | $110^{o}15'$ | $290^{o}15'$ |
| BC | $35^{o}15'$ | $215^{o}15'$ |
| CD | $276^{o}30'$ | $96^{o}30'$ |
| DE | $195^{o}30'$ | $15^{o}30'$ |
| EA | $132^{o}15'$ | $312^{o}15'$ |

7. (A) The following bearings were observed in a closed traverse ABCDA. Identify the stations effected by local attraction and correct it. (CO3)

| Line | FB | BB |
|---|---|---|
| AB | $46^{o}10'$ | $226^{o}10'$ |
| BC | $119^{o}20'$ | $298^{o}40'$ |
| CD | $169^{o}30'$ | $351^{o}10'$ |
| DA | $280^{o}20'$ | $99^{o}20'$ |

(OR)

(B).What are the instrumental errors that normally occur in doing survey with prismatic compass? How they can be avoided. (CO3)

8. (A) Draw the neat sketch of Dumpy level and mention its parts (CO4)

(OR)

(B) The following observations were observed on a continuously sloping ground:

0.605, 1.105, 1.895, 2.300, 0.950, 1.340, 1.975, 0.760, 1.785, 0.905 and 1.235.

The R.L of first point was 120.650.

Enter the readings properly into the levelling field book proforma. Reduce the levels by Height of Instrument method and Rise and Fall method. Apply the arithmetical check. (CO4)

-oOo-

**Model Paper for Unit Test-III**

**State Board of Technical Education and Training, A.P.**

**Diploma in Civil Engineering (DCE)**

**First Year :C-106 SURVEYING-I**

**Time: 90 Minutes** **Unit Test –III** **Maximum Marks : 40**

**PART- A** **16 Marks**

**Instructions :**

**(i) Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1. (a) B.S = 1.525 and R.L of B.M=+100.000 then Height of the Instrument is _____ (CO4)

   (b) Line joining the points of same elevation is called_____ (CO4)

   (c) Level difference between any two consecutive contours is called _____ (CO4)

   (d) Pentagraph is used to _____ (CO5)

2. Define (i) Contour interval and (ii) Contour gradient. (CO4)
3. What is reciprocal levelling? When it is resorted to? (CO4)
4. State any three characteristics of contours. (CO4)
5. State any three uses of Abney level. (CO5)

**PART- B** **3 x 8 = 24 Marks**

**Instructions : (i) Answer all questions**

**(ii) Each question carries EIGHT marks**

**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A) The following reciprocal levels were taken with Dumpy level. (CO4)

| Instrument at | Staff readings on | | Remarks |
|---|---|---|---|
| | A | B | AB = 1200m |
| A | 1.156 | 2.597 | RL of A = +625.555 |

| | | | |
|---|---|---|---|
| B | 0.987 | 2.418 | |

Find (i) True level difference between A and B (ii) RL of B (iii) The combined correction for curvature and refraction and (iv) The error in collimation adjustment of the level.

(OR)

(B) Describe briefly the effect of curvature and refraction in levelling. Derive an expression for curvature correction, refraction correction and for combined correction. (CO4)

7. (A) The following is the page of a level book entered in pencil. Some of the entries got erased, and have been marked with crosses. Calculate the missing readings. (CO4)

| Station | BS | IS | FS | Rise | Fall | RL |
|---|---|---|---|---|---|---|
| 1 | x | | | | | 150.000 |
| 2 | | 2.457 | | 0.827 | | X |
| 3 | | 2.400 | | x | | X |
| 4 | 2.697 | | x | | x | 148.070 |
| 5 | x | | 2.051 | | | 148.716 |
| 6 | | 2.500 | | | | 149.784 |
| 7 | | 2.896 | | | | 149.388 |
| 8 | | x | | | 0.124 | X |
| 9 | | | 2.672 | | | 149.612 |

(OR)

(B) The following observations were taken during the testing of a dumpy level. (CO4)

| Instrument Near to | Staff Readings on | |
|---|---|---|
| | A | B |
| A | 1.275 | 2.005 |
| B | 1.040 | 1.660 |

Is the instrument in adjustment? To what reading should the line of collimation be adjusted when the instrument is near to B.

8. (A) Workout the difference in levels between points A and B if curvature and refraction effects are taken into account in the following case: (CO4)

Level is setup over A, and the staff held at B
RL of A = 150.000,
Height of the Instrument at A = 1.000
Reading of staff at B = 1.800
Distance AB = 500m

(OR)

(B) The areas enclosed by the contours in a lake are as follows: (CO4)

| Contour (m) | 270 | 275 | 280 | 285 | 290 |
|---|---|---|---|---|---|
| Area (sqm) | 2050 | 8400 | 16300 | 24600 | 31500 |

Calculate the volume of water between the contours 270m and 290m by (i) Trapezoidal formula (ii) Prismoidal formula.

***

**Model paper for End Exam**

**MODEL PAPER – BOARD DIPLOMA EXAMINATION, (C–20)**

**DCE—FIRST YEAR EXAMINATION**

**SURVEYING-I (C-106)**

**Time: 3 hours] [Total Marks: 80**

**PART—A 3×10=30 Marks**

***Instructions:*** **(1) Answer all questions.**

**(2) Each question carries three marks.**

**(3) Answers should be brief and straight to the point and shall not exceed *five* simple sentence**

1) State the Classification of Survey based on the Instruments used. (CO1)
2) What are the equipment used in Chain surveying?. (CO2)
3) What is an Offset? Distinguish between perpendicular and oblique offsets. (CO2)
4) Distinguish between Magnetic bearing and True bearing of a Survey line. (CO3)
5) Convert the following Whole Circle Bearings to Quandrantal Bearings.
   (i) $25^0 30'$ (ii) $165^0 20'$ (iii) $312^0 45'$ (CO3)
6) Define (i) Back Sight (ii) Fore Sight (iii) Intermediate Sight (CO4)
7) State the relationship between the Fundamental Lines of a Level. (CO4)
8) Write the differences between Height of Inst and Rise and Fall methods. (CO4)
9) State any three uses of Contour Maps. (CO4)
10) State any three uses of Abney Level. (CO5)

**PART – B 8 x 5 marks = 40 marks**

***Instructions :*****Answer either (a) or (b) from each questions from Part-B**

11) (A) Explain with a sketch the process of Indirect Ranging. (CO2)

**(OR)**

(B) From the following Cross Staff Survey of Field ABCDEFG and calculate its Area in Hectares. The readings are in meters. (CO2)

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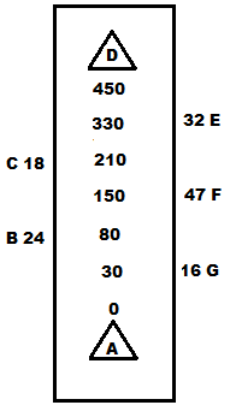


12) (A) Explain the operations involved in chaining on Sloping ground (CO2)

**(OR)**

(B) Calculate the area enclosed between the chain line and the irregular boundary using Trapezoidal and Simpson's rule from the data given. (CO2)

| Distance(m) | 0 | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 |
|---|---|---|---|---|---|---|---|---|---|
| Offset (m) | 048 | 1.36 | 1.57 | 3.1 | 2.65 | 2.05 | 1.98 | 1.56 | 0.85 |

13) (A) Draw a neat sketch of a Prismatic Compass and explain the function of the parts. (CO3)

**(OR)**

(B) The following bearings were observed in running a compass traverse. (CO3)

| Line | F.B. | B.B. | Line | F.B. | B.B. |
|---|---|---|---|---|---|
| AB | $45^0 15'$ | $225^0 15'$ | BC | $123^0 15'$ | $303^0 15'$ |
| CD | $181^0 00'$ | $1^0 00'$ | DA | $289^0 30'$ | $109^0 30'$ |

Calculate the interior angles of the traverse)

14) (A) State Various methods of Levelling and Describe the method of Reciprocal levelling. ( CO4)

**(OR)**

(B) While performing Reciprocal levelling between two points P and Q on opposite banks of a Pond, the level was setup near P and the staff readings on P and Q were 1.985 and 3.525 m respectively. The Level was then moved near to Q and the respective Staff readings on P and Q were 1.645 and 2.975. Find the true difference in levels of P and Q. Also find the RL of Q, if RL of P is 325.00 m. (CO4)

15) (A) The following readings were observed successfully with a levelling Instrument. The Instrument was shifted after $5^{th}$ and $11^{th}$ readings. Draw up a page of Level book and determine the R.L. of various points if R.L. of first reading was 158.340 m. Use Height of Collimation method.

0.475, 1.015, 1.625, 3.185, 3.925, 0.565, 1.275, 1.805, 2.495, 3.410, 3.785, 1.745, 0.615 and 0.580. (CO4)

**(OR)**

(B) Explain Contouring by i) Method of Squares and ii) Cross-Section Method. (CO4)

**PART – C**

**Question No.16 is compulsory and carries 10 marks 10 x1 = 10 marks**

16) Explain the method of conducting Profile levelling and write its application in civil engineering works. (CO4)

***

| Course Code | Course Title | No. of Periods per Week | Total No. of Periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-107 | ENGINEERING DRAWING | 06 | 180 | 40 | 60 |

| S.No | Major Topics | Periods | COs Mapped |
|---|---|---|---|
| 1 | Importance of Engineering Drawing | 01 | **CO1** |
| 2 | Engineering Drawing Instruments | 05 | **CO1** |
| 3 | Free hand lettering & Numbering | 06 | **CO1** |
| 4 | Dimensioning Practice | 09 | **CO1** |
| 5 | Geometrical constructions | 21 | **CO2** |
| 6 | Projections of points, Lines, Planes & Solids | 21 | **CO3** |
| 7 | Auxiliary views | 6 | **CO3** |
| 8 | Sections of Solids | 27 | **CO3** |
| 9 | Orthographic Projections | 33 | **CO3** |
| 10 | Isometric Views | 30 | **CO4** |
| 11 | Development of surfaces | 21 | **CO5** |
| | **Total** | **180** | |

**COURSE OBJECTIVES:**

| Upon completion of the course the student shall able to | |
|---|---|
| **Course Objectives** | understand the basic graphic skills and use them in preparation of engineering drawings, their reading and interpretation |

**COURSE OUTCOMES:**

| | | | |
|---|---|---|---|
| **Course Outcomes** | CO1 | C-107.1 | Practice the use of engineering drawing instruments and Familiarise with the conventions to be followed in engineering drawing as per BIS |
| | CO2 | C-107.2 | Construct the i) basic geometrical constructions ii) engineering curves |
| | CO3 | C-107.3 | Visualise and draw the orthographic projections of i) Points ii) Lines iii) Regular Planes iv) Regular Solids V) Sections of Regular Solids . |
| | CO4 | C-107.4 | Visualise and draw the isometric views of objects . |
| | CO5 | C-107.5 | Draw the developments of surfaces of regular solids and thereby the components used in daily applications |

**LEARNING OUTCOMES:**

| | |
|---|---|
| **Learning Outcomes** | **1.0** Understand the basic concepts of Engineering Drawing<br>1.1 State the importance of drawing as an engineering communication medium<br>1.2 State the necessity of B.I.S. Code of practice for Engineering Drawing.<br>1.3 Explain the linkages between Engineering drawing and other subjects of Mechanical Engineering<br>**2.0 Use of Engineering Drawing Instruments**<br>2.1 Select the correct instruments to draw the different lines / curves<br>2.2 Use correct grade of pencil to draw different types of lines and for |

| | |
|---|---|
| | different purposes<br>2.3 Select and use appropriate scales for a given application.<br>2.4 Identify different drawing sheet sizes as per I.S. and Standard Lay- outs.<br>2.5 Prepare Title block as per B.I.S. Specifications.<br>2.6 Identify the steps to be taken to keep the drawing clean and tidy.<br>Drawing Plate 1: (Having two exercises)<br>**3.0 Write Free Hand Lettering and Numbers**<br>3.1 Write titles using sloping lettering and numerals of 7mm, 10mm and 14mm height<br>3.2 Write titles using vertical lettering and numerals of 7mm, 10mm and 14mm height<br>3.3 Select suitable sizes of lettering for different layouts and applications Drawing plate 2: (Having 5 to 6 exercises)<br><br>**4.0 Understand Dimensioning Practice**<br>4.2 Acquaint with the conventions, notations, rules and methods of dimensioning in engineering drawing as per the B.I.S.<br>4.3 Dimension a given drawing using standard notations anddesiredsystem of dimensioning.<br>Drawing Plate 3: (Having 08 to10 exercises)<br>**5.0 Apply Principles of Geometric Constructions**<br>5.1 Practice the basic geometric constructions like<br>i) dividing a line into equal parts<br>ii) exterior and interior tangents to the given two circles iii) tangent arcs to two given lines and arcs<br>5.2 Draw any regular polygon using general method when<br>i) side length is given ii) inscribing circle radius is given<br>iii) describing circle radius is given<br>5.3 Draw the conics using general and special methods,<br>5.4 Draw the engineering curves like i) involute ii) cycloidiii) helix<br>5.5 Identify the applications of the above constructions in engineering practice.<br>Drawing Plate -4: Having problems up to construction of polygon<br>Drawing Plate -5: Having problems of construction of conics<br>Drawing Plate -6: Having problems of construction of involutes, cycloid and helix<br>**6.0 Apply Principles of Projection of points, lines, planes &auxiliary planes**<br>6.1 Explain the basic principles of the orthographic projections<br>6.2 Visualise and draw the projection of a point with respect to reference planes (HP&VP)<br>6.3 Visualise and draw the projections of straight lines with respect to two reference Planes (up to lines parallel to one plane and inclined to other plane)<br>6.4 Visualise and draw the projections of planes (up to planes |

| | |
|---|---|
| | perpendicular to one plane and inclined to other plane)<br>6.5 Identify the need of Auxiliary views for a given engineering drawing.<br>6.6 Draw the auxiliary views of a given engineering component<br>Drawing Plate -7: Having problems up to projection of points and Lines (15 exercises)<br>Drawing Plate -8: Having problems of projection of planes (6 exercises)<br>Drawing Plate -9: Having problems on auxiliary planes (Having 4 exercises)<br>**7.0 Draw the Projections of Solids**<br>7.1 Visualise and draw the projections of solids (up to axis of solids parallel to one plane and inclined to other plane)<br>Drawing plate No.10: Having problems of projection of solids (10 exercises)<br><br>**8.0 Appreciate the need of Sectional Views**<br>8.1 Identify the need to draw sectional views.<br>8.2 Differentiate between true shape and apparent shape of section<br>8.3 Draw sectional views and true sections of regular solids by applying the principles of hatching.<br>Drawing Plate–11: Having problems of section of solids (6 exercises)<br>**9.0 Apply principles of orthographic projection**<br>9.1 Draw the orthographic views of an object from its pictorial drawing.<br>9.2 Draw the minimum number of views needed to represent a given object fully.<br>Drawing Plate 12 : (Having 10 to 12 exercises)<br>**10.0 Prepare pictorial drawings**<br>10.1 identify the need of pictorial drawings.<br>10.2 Differentiate between isometric scale and true scale.<br>10.3 Prepare Isometric views for the given orthographic drawings.<br>Drawing plate 13: (Having 10 to 12 exercises)<br>**11.0 Interpret Development of surfaces of different solids**<br>11.1 State the need for preparing development drawing.<br>11.2 Draw the development of simple engineering objects (cubes, prisms, cylinders, cones, pyramid) using parallel line and radial line method.<br>11.3 Prepare development of surface of engineering components like i) funnel ii) $90^0$ elbow<br>Drawing plate No. 14: (Having 05 exercises) |
| | 2.0 |

**PO-CO Mapping**

| **Course Code : C-107** | **Course Title ENGINEERING DRAWING**<br>**Number of Course Outcomes: 06** | | | **No. of Periods 180** |
|---|---|---|---|---|
| **POs** | **Mapped with CO No.** | **CO Periods addressing PO in** | **Level (1,2,3)** | **Remarks** |

| | | Column 1 | | | |
|---|---|---|---|---|---|
| | | No | % | | |
| PO1 | CO1, CO2, CO3, CO4, CO5 | 12 | 7 | 1 | >40% Level.3 (Highly addressed)<br>25% - 40% Level.2 (Moderately addressed)<br><br>5% - 25% Level.1 (Low addressed)<br><5% Not addressed |
| PO2 | CO1, CO2, CO3, CO4, CO5 | 12 | 7 | 1 | |
| PO3 | CO1, CO2, CO3, CO4, CO5 | 72 | 40 | 3 | |
| PO4 | CO1, CO2, CO3, CO4, CO5 | 72 | 40 | 3 | |
| PO5 | | | | | |
| PO6 | CO1, CO2, CO3, CO4, CO5 | 12 | 6 | 1 | |
| PO7 | | | | | |

***CO-PO Mapping***

| CO No. | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 3 | 3 | | 2 | | 1 | 2 | 2 |
| CO2 | 2 | 3 | 3 | 3 | | 2 | | 1 | 2 | 2 |
| CO3 | 3 | 2 | 3 | 3 | | 3 | | 1 | 2 | 2 |
| CO4 | 3 | 2 | 3 | 3 | | 3 | | 2 | 2 | 2 |
| CO5 | 3 | 2 | 3 | 3 | | 3 | | 2 | 2 | 2 |
| Average | 2.6 | 2.2 | 3 | 3 | | 2.6 | | 1.4 | 2 | 2 |

**Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**

**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc**

**Key competencies to be achieved by the student**

| S.No | Major topic | Key Competency |
|---|---|---|
| 1. | Importance of Engineering Drawing | • Explain the linkages between Engineering drawing and other subjects of study in Diploma course. |
| 2. | Engineering Drawing Instruments | • Select the correct instruments to draw various entities in different orientation |
| 3. | Free hand lettering & Numbering | • Write titles using sloping and vertical lettering and numerals as per B.I.S (Bureau of Indian standards) |

| | | |
|---|---|---|
| 4. | Dimensioning Practice | • Dimension a given drawing using standard notations and desired system of dimensioning |
| 5. | Geometrical construction | • Construct ellipse, parabola, rectangular hyperbola, involute, cycloid and helix from the given data. |
| 6. | Projection of points, Lines, Planes & Solids | • Draw the projections of points, straight lines, planes & solids with respect to reference planes (HP& VP) |
| 7. | Auxiliary views | • Draw the auxiliary views of a given Engineering component<br>• Differentiate between Auxiliary view and apparent view |
| 8. | Sections of Solids | • Differentiate between true shape and apparent shape of section<br>• Apply principles of hatching.<br>• Draw simple sections of regular solids |
| 9. | Orthographic Projection | • Draw the minimum number of views needed to represent a given object fully. |
| 10. | Pictorial Drawings | • Differentiate between isometric scale and true scale.<br>• Draw the isometric views of given objects,. |
| 11. | Development of surfaces | • Prepare development of Surface of regular solids and other components like i) funnel ii) $90^0$ elbow |

**COURSE CONTENT**

**NOTES:*1.B.I.S Specification should invariably be followed in all the topics.***

**2. A-3 Size Drawing Sheets are to be used for all Drawing Practice Exercises.**

**1.0 The importance of Engineering Drawing**

Explanation of the scope and objectives of the subject of Engineering Drawing Its importance as a graphic communication -Need for preparing drawing as per standards – SP-46 –1988 – Mention B.I.S - Role of drawing in -engineering education – Link between Engineering drawing and other subjects of study.

**2.0 Engineering drawing Instruments**

Classifications: Basic Tools, tools for drawing straight lines, tools for curved lines, tools for measuring distances and special tools like mini drafter & drafting machine – Mentioning of names under each classification and their brief description -Scales: Recommended scales reduced & enlarged -Lines: Types of lines, selection of line thickness - Selection of Pencils - Sheet Sizes: A0, A1, A2, A3, A4, A5, Layout of drawing sheets in respect of A0, A1, A3 sizes, Sizes of the Title block and its contents - Care and maintenance of Drawing Sheet, Drawing plate: Lay out of sheet – as per SP-46-1988 to a suitable scale - Simple Exercises on the use of Drawing Instruments. Importance of Title Block.

**3.0 Free hand lettering & numbering**

Importance of lettering – Types of lettering -Guide Lines for Lettering - Practicing of letters &numbers of given sizes (7mm, 10mm and 14mm) -Advantages of single stroke or simple style of lettering - Use of lettering stencils

**4.0 Dimensioning practice**

Purpose of engineering Drawing, Need of B.I.S code in dimensioning -Shape description of an Engineering object -Definition of Dimensioning size description -Location of features, surface finish, fully dimensioned Drawing -Notations or tools of dimensioning, dimension line extension line, leader line, arrows, symbols, number and notes, rules to be observed in the use of above tools -Placing dimensions: Aligned system and unidirectional system ( SP-46-1988)-Arrangement of dimensions Chain, parallel, combined progressive, and dimensioning by co-ordinate methods-The rules for dimensioning standard, features "Circles (holes) arcs, angles, tapers, chamfers, and dimension of narrow spaces.

**5.0 Geometric Construction**

Division of a line: to divide a straight line into given number of equal parts -Construction of tangent lines: to draw interior and exterior tangents to two circles of given radii and centre distance -Construction of tangent arcs: -i) To draw tangent arc of given radius to touch two lines inclined at given angle (acute, right and obtuse angles)-ii)Tangent arc of given radius touching a circle or an arc and a given line-iii)Tangent arcs of radius R, touching two given circles internally and externally -Construction of polygon: construction of any regular polygon by general method for given side length, inscribing circle radius and describing/superscribing circle radius - Conics: Explanation of Ellipse, Parabola, Hyperbola, as sections of a double cone and a loci of a moving point, Eccentricity of above curves – Their Engg. Applications viz., Projectiles, reflectors, P-V Diagram of a Hyperbolic process - Construction of any conic section of given eccentricity by general method -Construction of ellipse by concentric circles method, Oblong Method and Arcs of circles method -Construction of parabola by rectangle method and Tangent method -Construction of rectangular hyperbola - General Curves: Involute, Cycloid and Helix, explanations as locus of a moving point -their engineering application, viz., Gear tooth profile, screw threads, springs etc. –their construction

**6.0 Projection of points, lines and planes & solids**

Classification of projections, Observer, Object, Projectors, Projection, Reference Planes, Reference Line, Various angles of projections –Differences between first angle and third angle projections -Projections of points in different quadrants -Projections of straight line – (a)Parallel to both the planes (b)Perpendicular to one of the planes (c)Inclined to one plane and parallel to other planes - Projections of regular planes - (a) Plane parallel to one of the reference planes - (b) Plane perpendicular to HP and inclined to VP and vice versa - Projections of regular solids - (a) Axis perpendicular to one of the planes (b)Axis parallel to VP and inclined to HP and vice versa.

**7.0 Auxiliary views**

Need for drawing auxiliary views -Explanation of the basic principles of drawing an auxiliary views explanation of reference plane and auxiliary plane -Partial auxiliary view.

**8.0 Sections of Solids**

Need for drawing sectional views – what is a sectional view - Hatching – Section of regular solids inclined to one plane and parallel to other plane

**9.0 Orthographic Projections**

Meaning of orthographic projection -Using a viewing box and a model – Number of views obtained on the six faces of the box, - Legible sketches of only 3 views for describing object - Concept of front view, top view, and side view sketching these views for a number of engg objects - Explanation of first angle projection. – Positioning of three views in First angle projection - Projection of points as a means of locating the corners of the surfaces of an object – Use of miter line in drawing a third view when other two views are given -Method of representing hidden lines -Selection of minimum number of views to describe an object fully.

**10.0 Pictorial Drawings**

Brief description of different types of pictorial drawing viz., Isometric, oblique, and Perspective and their use - Isometric drawings: Iso axis, angle between them, meaning of visual distortion in dimensions - Need for an isometric scale, difference between Isometric scale, and ordinary scale difference between Isometric view and Isometric projection - Isometric and non-Isometric lines -Isometric drawing of common features like rectangles, circular - shapes, non-isometric lines - Use of box and offset methods.

**11.0 Development of Surfaces**

Need for preparing development of surface with reference to sheet metal work-Concept of true length of a line with reference to its orthographic projection when the line is (i) parallel to the plane of projection (ii) inclined to one principal and parallel to the other - Development of simple solids like cubes, prisms, cylinders, cones, pyramid and truncation of these solids-Types of development: Parallel line and radial line development -Procedure of drawing development of funnels, $90^0$ elbow pipes.

**REFERENCE BOOKS:**


1. Engineering Drawing,N.D.Bhatt, Charotar Publications :
2. Engineering Graphics ,P I Varghese, McGraw-hill
3. Engineering Drawing,Basant Agarwal & C.M Agarwal,McGraw-hill
4. SP-46-1998, Bureau of Indian Standards.

**MODEL BLUE PRINT**

| S. No | Major Topics | No. of periods | Weightage of marks | Marks wise Distribution of Weightage | | | | Question wise Distribution of Weightage | | | | CO's Mapped |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | R | U | Ap | An | R | U | Ap | An | |
| 1 | Importance of Engineering Drawing | 01 | - | | | | | | | | | **CO1** |
| 2 | Engineering Drawing Instruments | 05 | - | | | | | | | | | **CO1** |
| 3 | Free hand lettering & Numbering | 06 | 5 | | 5 | | | | 1 | | | **CO1** |
| 4 | Dimensioning Practice | 09 | 5 | | 5 | | | | 1 | | | **CO1** |
| 5 | Geometrical constructions | 21 | 15 | | 5 | 10 | | | 1 | 1 | | **CO2** |
| 6 | Projections of points, Lines, Planes & Solids | 21 | 10 | | | 10 | | | | 1 | | **CO3** |
| 7 | Auxiliary views | 6 | 5 | | 5 | | | | 1 | | | **CO3** |
| 8 | Sections of Solids | 27 | 10 | | | 10 | | | | 1 | | **CO3** |
| 9 | Orthographic Projections | 33 | 10 | | | 10 | | | | 1 | | **CO3** |
| 10 | Isometric Views | 30 | 10 | | | 10 | | | | 1 | | **CO4** |
| 11 | Development of surfaces | 21 | 10 | | | 10 | | | | 1 | | **CO5** |
| Total | | 180 | 80 | | 20 | 60 | | | 4 | 6 | | |

**Note : Students have to write four out of six 10 marks questions.**

**Model Paper for End Examination**

**MODEL PAPER – BOARD DIPLOMA EXAMINATION, (C–20)**

**DCE—FIRST YEAR EXAMINATION**

**ENGINEERING DRAWING (C-107)**

**Time: 3 hours]** **[Total Marks: 80**

**PART—A ( 5 X 4 = 20 Marks)**

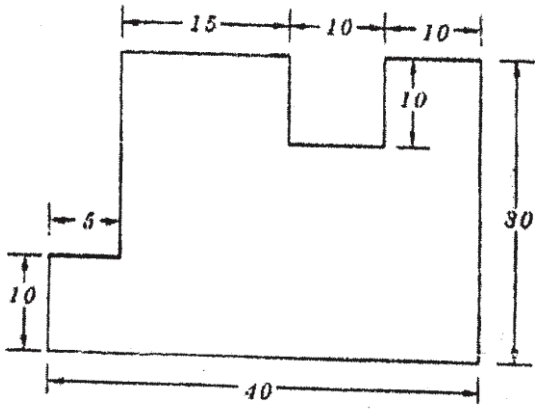
***Instructions:*** **(1) Answer all questions.**

**(2) Each question carries five marks.**

**(3) All dimensions are in mm.**

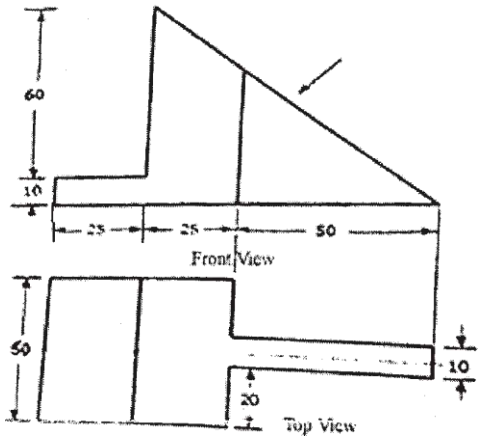
1. Write the following in single-stroke vertical lettering of size 10 mm in capital letters:"CLEAN AND GREEN IS OUR PERFECT DREAM" (CO1)

2. Redraw the following figure to full-scale and dimension it according to SP : 46—1988byusingalignedsystem:
(CO1)




3. Drawacommonexternaltangenttotwocirclesofradii25 mm and 20 mm. The distance between hecentresofcirclesis75mm. (CO2)

4. Draw the auxiliary view of the objects given below: (CO3)




**PART—B( 10 x 4=40)**

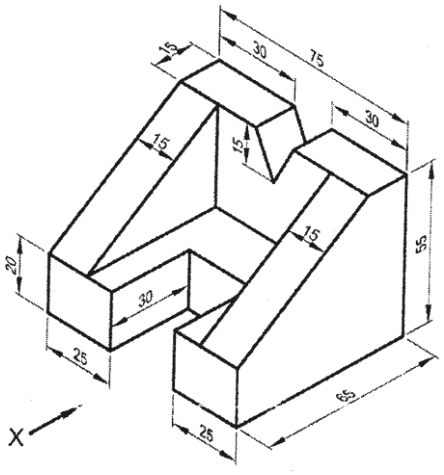
**Instructions*:*** **(1) Answer *any* four questions.**
**(2) Each question carries ten marks.**
**(3) All dimensions are in mm.**

5. Drawahelixofcylinderdiameter50mmandpitch70mm. (CO2)

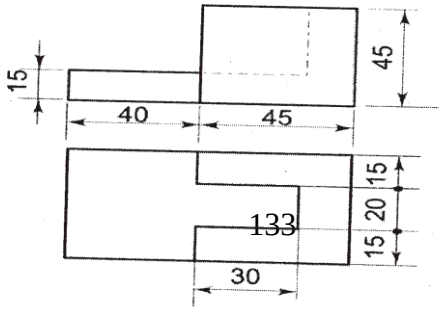
6. Draw the top view and front view of a circular plane, if the surfaceoftheplaneisperpendiculartoHPandinclinedat30ºtoVP. (CO3)

7. A hexagonal pyramid of base side 30 mm and axis 75 mm long is resting on its base in HP having a base side parallel to VP. It is cut by a section plane which is inclined at 30º to HP, perpendicular to VP and passing through a point on the axis at a distance of 35 mm from the vertex. Draw its sectional front view and sectional top view. (CO3)

8. Draw the Front view, top view and side view of the given figure: (CO3)




9. Draw the isometric view of the object for the views given below. (CO4)



10. A right circular cone of diameter 50 mm and axis 75 mm long is resting on its base in HP. It is cut by a section plane which is perpendicular to VP, inclined at 60º to HP and passing through a point on the axis at a height of 40 mm from the base. Draw the surface development of the bottom position of truncatedcone. (CO5)

***

## SURVEYING-I PRACTICE & PLOTTING

| Course Code | Course Title | No. of Periods per Week | Total No. of Periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-108 | SURVEYING-I PRACTICE & PLOTTING | 06 | 180 | 40 (30 for class exercises + 10 for Survey camp) | 60 |

| S. No. | Major Topics | No. of Periods | COs MAPPED |
|---|---|---|---|
| 1. | Chain surveying | 42 | CO1 |
| 2. | Compass Surveying | 42 | CO2 |
| 3. | Levelling | 60 | CO3 |
| 4. | Plotting | 36 | CO1,CO2,CO3 |
| | **Total** | **180** | |
| 5 | A Survey camp, immediately after completion of all exercises, shall be conducted for 3 days during 8 AM to 12 noon & 2PM to 4 PM on each day followed by one day break and 2 days of plotting from 9AM to 5 PM, with one hour lunch break. (25% of total sessional marks shall be allocated to this activity. The skills learnt during class exercises shall be demonstrated in a simulated field like situation and shall be assessed appropriately) | 6 days (Additional instructional duration & NOT to be included in the above 180 periods) | CO1,CO2,CO3 |

**COURSE OBJECTIVES:**

| | | |
|---|---|---|
| **Course Objectives** | (i) | Enhance knowledge about surveying instruments & methods adopted to carry out Field Survey with a professional approach. |
| | (ii) | Develop skills in using chain, tape, compass& Dumpy level |

**COURSE OUTCOMES:**

| | | | |
|---|---|---|---|
| **Course Outcomes** | CO1 | C-108.1 | Apply standard Practices to perform chain survey in the field and to plot from field data |
| | CO2 | C-108.2 | Apply Principles to Perform compass survey and plot from field data |
| | CO3 | C-108.3 | Conduct experiments on methods of levelling, Longitudinal and cross sectioning for the given alignment and analyse the data by Block levelling (contours) prepare the drawings. |

| | |
|---|---|
| **Learning Outcomes** | **1.0 Chain surveying**<br>1.1. Practice unfolding and folding a chain.<br>1.2. Perform direct ranging on level ground and measure the distance between two given stations and record the measurements in the field book.<br>1.3. Perform indirect ranging and measure the distance between two given stations when a high ground intervenes to prevent indivisibility of ends of line.<br>1.4. Set out a right angle to a given chain line by using chain only.<br>1.5. Set and measure offsets for a given chain line by 1.Perpendicular offsets and 2.Oblique offsets.<br>1.6. Perform triangulation survey of a given area with chain and cross staff and record all necessary details.<br>1.7. Calculate the area bounded by the given points by chain triangulation and compare the result with the area calculated from plotting.<br>1.8. Calculate the area bounded by the given points by chain and Cross staff compares the result with the area calculated from plotting.<br>1.9. Carry out chain survey to overcome obstacles like pond, building etc and plot the Survey from field book measurements.<br>1.10. Carry out chain traversing to survey an area bounded by more than three stations and plot the Survey from field book measurements.<br>**2.0 Compass Survey**<br>2.1 Identify the parts of a prismatic Compass<br>2.2 Set up the compass at a station and carry out temporary adjustments.<br>2.3 Take bearings of two points from instrument station and calculate the included angle.<br>2.4 Perform an open traverse with Compass and Chain.<br>2.5 Perform a closed traverse with compass and chain.<br>2.7 Plot the closed traverse from field data and adjust for closing error by Bowditch rule.<br>2.8 Determine the area bounded by the given points by the method of Radiation.<br>2.9 Determine the distance between two accessible points involving single setting of the instrument.<br>2.10 Determine the distance between two inaccessible points involving setting of the instrument at two stations.<br>**3.0 Levelling**<br>3.1 Identify the component parts of a dumpy level / Auto level and Study different types of levelling staves<br>3.2 Perform temporary adjustments of a dumpy level / Auto level for taking observations and Practice taking staff readings and recording them in level field book.<br>3.3 Take staff readings for differential levelling and Compute the difference in elevation between two stations (take invert levels also)<br>3.4 Determine the true difference in elevation between two far off stations by conducting reciprocal levelling |

| | |
|---|---|
| | 3.5 Determine the collimation error of a dumpy level by conducting reciprocal levelling<br>3.6 Conduct profile levelling along a route and compute the RLs at various stations<br>3.7 Conduct profile levelling by taking cross sections across a route and compute the RLs at various stations<br>3.8 Conduct profile levelling along a route by taking readings along both LS and CS and compute the RLs<br>3.9 Conduct block levelling for the given area<br>3.10 Locate the contour Points by direct (Radial) method in the field<br>**4.0 PLOTTING**<br>4.1 Understand the importance and relation between field work and plotting. |

**PO-CO Mapping:**

| **Course Code: C-108** | **Course Title: SURVEYING –II Practice&Plotting No. of COs: 3** | | | | **No. of Periods: 180** |
|---|---|---|---|---|---|
| **POs** | **Mapped with CO Nos.** | **CO periods addressing PO in Col.1** | | **Level (1,2,3)** | **Remarks** |
| | | **No.** | **%** | | |
| 1 | 1,2,3 | 47 | 26 | 2 | >40% Level.3 (Highly addressed)<br>25% - 40% Level.2 (Moderately addressed<br>5% - 25% Level.1 (Low addressed)<br><5% Not addressed |
| 2 | 1,2,3 | 27 | 15 | 1 | |
| 3 | | | | | |
| 4 | 1,2,3 | 76 | 42 | 3 | |
| 5 | 1,2,3 | 10 | 6 | 1 | |
| 6 | 1,2,3 | 10 | 6 | 1 | |
| 7 | 1,2,3 | 10 | 5 | 1 | |

**CO-PO Mapping:**

| CO No. | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| CO2 | 2 | 3 | | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| CO3 | 3 | 2 | | 3 | 3 | 3 | 2 | 2 | 2 | 2 |
| **Average** | **2.3** | **2.3** | | **2.3** | **2.3** | **2.3** | **2** | **2** | **2** | **2** |

**Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**

**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc**

**COURSE CONTENT**

**1.0 Chain Surveying**

a) Practice unfolding and folding of a chain.
b) Ranging and chaining of lines on level ground and recording in field book to measure the distance between two stations.
c) Chaining a line involving indirect ranging.
d) Setting and measuring the offsets-Perpendicular and Oblique offsets
e) Measurement of land areas –cross staff survey
f) Chain triangulation around the building covering a small area with other details taking offsets and recording.
g) Chain triangulation involving a road with other details taking offsets and recording.
h) Chain traversing to survey an area bounded by more than three stations.

**2.0 Compass Surveying**

a) Setting up the compass – observations of bearings
b) Calculation of included angles from the observed bearings
c) Traversing with prismatic compass and chain – open Traverse – Recording.
d) Traversing with prismatic compass and chain- closed traverse - recording.
e) Plotting the closed traverse from field data and adjust for closing error by Bowditch rule.
f) Determination of the area bounded by the given points by the method of Radiation
g) Determination of the distance between two accessible points involving single setting of the instrument
h) Determination of the distance between two inaccessible points involving setting of the instrument at two stations.

**3.0 Levelling**

a) Study of dumpy level, levelling staves – performing Temporary adjustments of level.
b) Taking staff readings of various stations – booking of readings in level field book.
c) Differential and Fly levelling – calculation of reducing levels by height of collimation and Rise & Fall methods (inverted levels also)
d) Reciprocal levelling – True difference in elevation and collimation error.
e) Profile levelling along a route by taking readings along both LS and CS and compute the RLs
f) Contouring – block levelling and locating contour points by Radial method

**4.0 Plotting**

a) Conventional signs in Surveying — 2 Exercises
b) Plotting of perpendicular offsets — 1 Exercise
c) Plotting of land surveys – Chain and cross-staff Surveying – Calculation of areas — 3 Exercises
d) Plotting of chain triangulation Surveying of small areas around Buildings. — 2 Exercises
e) Chain traversing to survey an area bounded by more than three stations — 2 Exercises
f) Plotting of closed traverse by Compass surveying – location of Details and adjusting error byBow ditch method. — 2 Exercises

| | | |
|---|---|---|
| g) | Plotting of open traverse by Compass surveying and locating details | 2 Exercises. |
| h) | Compass survey by method of radiation-calculation of area | 1 Exercise |
| i) | Determination of the distance between two accessible points involving single setting of the instrument | 1 Exercise |
| j) | Determination of the distance between two inaccessible points involving setting of the instrument at two stations. | 2 Exercises |
| k) | Plotting of LS and CS | 2 Exercises |
| l) | Plotting of contours by Block levelling | 2 Exercises |
| | | --- |
| | Total | 24 Exercises |
| | | --- |

**KEY competencies to be achieved by the student**

| S.NO. | Experiment Title | Key Competency |
|---|---|---|
| 1 | Field Exercises in Chain Surveying<br>Ex 1.1<br>Ex 1.2<br>Ex 1.3<br>Ex 1.4<br>Ex 1.5<br>Ex 1.6<br>Ex.1.7<br>Ex.1.8<br>Ex 1.9<br>Ex 1.10 | • Practice unfolding and folding a chain.<br>• Perform direct ranging on level ground and measure the distance between two given stations and record the measurements in the field book.<br>• Perform indirect ranging and measure the distance between two given stations when a high ground intervenes to prevent intervisibility of ends of line.<br>• Set out a right angle to a given chain line by using chain only.<br>• Set and measure offsets for a given chain line by 1. Perpendicular offsets and 2.Oblique offsets.<br>• Perform triangulation survey of a given area with chain and cross staff and record all necessary details.<br>• Calculate the area bounded by the given points by chain triangulation and compare the result |

| | | |
|---|---|---|
| | | with the area calculated from plotting.<br>• Calculate the area bounded by the given points by chain and Cross staff compare the result with the area calculated from plotting.<br>• Carry out chain survey to overcome obstacles like pond, building etc and plot the Survey from field book measurements.<br>• Carry out chain traversing to survey an area bounded by more than three stations and plot the Survey from field book measurements. |
| 2 | Field Exercises in Compass Surveying<br>Ex 2.1<br>Ex 2.2<br>Ex 2.3<br>Ex 2.4<br>Ex 2.5<br>Ex 2.6<br>Ex.2.7<br>Ex.2.8<br>Ex 2.9 | • Identify the parts of a prismatic Compass<br>• Set up the compass at a station and carry out temporary adjustments.<br>• Take bearings of two points from instrument station and calculate the included angle.<br>• Perform an open traverse with Compass and Chain.<br>• Perform a closed traverse with compass and chain.<br>• Plot the closed traverse from field data and adjust for closing error by Bowditch rule.<br>• Determine the area bounded by the given points by the method of Radiation.<br>• Determine the distance between two accessible points involving single setting of the instrument.<br>• Determine the distance between two inaccessible points involving setting of the instrument at two stations. |
| 3 | Field Exercises in Levelling<br>Ex 3.1<br>Ex 3.2 | • Identify the component parts of a dumpy level / Auto level and Study different types of levelling staves<br>• Perform temporary adjustments of a dumpy |

| | | |
|---|---|---|
| | Ex 3.3<br><br>Ex 3.4<br><br>Ex 3.5<br><br>Ex 3.6<br><br>Ex.3.7<br><br>Ex.3.8<br><br>Ex 3.9<br><br>Ex 3.10 | level / Auto level for taking observations and Practice taking staff readings and recording them in level field book<br><br>• Take staff readings for differential levelling and Compute the difference in elevation between two stations (take invert levels also)<br><br>• Determine the true difference in elevation between two far off stations by conducting reciprocal levelling<br><br>• Determine the collimation error of a dumpy level by conducting reciprocal levelling<br><br>• Conduct profile levelling along a route and compute the RLs at various stations<br><br>• Conduct profile levelling by taking cross sections across a route and compute the RLs at various stations<br><br>• Conduct profile levelling along a route by taking readings along both LS and CS and compute the RLs<br><br>• Conduct block levelling for the given area<br><br>• Locate the contour Points by direct (Radial) method in the field |

**PHYSICSLABPRACTICE**

**(C-20CURRIUCULUMCOMMONTOALLBRANCHES)**

| Subject Code | Subject Title | Periods per week | Total periods per year |
|---|---|---|---|
| C-109A | Physics Laboratory | 03 | 45 |

**TIMESCHEDULE**

| S.No | NameoftheExperiment | No.of Periods |
|---|---|---|
| 1. | Handson practice on Vernier Calipers | 03 |
| 2. | Handson practice on Screw gauge | 03 |
| 3. | Verification of Parallelogram law of forces and Triangle law of forces | 03 |
| 4. | Simple pendulum | 03 |
| 5. | Velocity of sound in air – (Resonance method) | 03 |
| 6. | Focal length and Focal power of convex lens (Separate & Combination)(**Single)** | 03 |
| 7. | Refractive index of solid using traveling microscope | 03 |
| 8. | Boyle's law verification | 03 |
| 9. | Meter bridge | 03 |
| 10. | Mapping of magnet lines of force and locate null points | 03 |
| | **DEMONSTRATIONEXPERIMENTS** | |
| 11. | Surface tension of liquid using traveling microscope | 03 |
| 12. | Coefficient of viscosity by capillary method | 03 |
| | Revision | 06 |
| | Test | 03 |
| | **Total** | **45** |

**Objectives:**

*Upon completion of the course the student shall be able to*

1.0 Practice with Vernier calipers to determine the volumes and areas of a cylinder and sphere and their comparison etc .

2.0 Practice with Screw gauge to determine thickness of a glass plate, cross sectional area of a wire and volumes of sphere and also their comparison etc

3.0 Verify the parallelogram law and Triangle law

4.0 Determine the value of acceleration due to gravity using Simple Pendulum

5.0 Determine the velocity of sound in air at room temperature and its value at zero degree centigrade.

6.0 Calculate the Focal length and focal power of convex lenses using distant object method , U-V method,U-V graphand1/U–1/Vgraph methods and their comparison.

7.0 Determine the refractive index of a solid using travelling microscope.

8.0 Verify the Boyle's law employing a Quill tube.

9.0 Determine the specific resistance of material of a wire using Meter Bridge.

10.0 Drawing magnetic lines of force under N-S and N-N methods and locate nullpoints.

11.0 Determine the surface tension of a liquid using travelling Microscope(**Demo)**
Determine the viscosity of a liquid using capillary method (**Demo)**

**Competencies and Key competencies to be achieved by the student**

| **NameoftheExperiment** | **Competencies** | **Keycompetencies** |
|---|---|---|
| 1. Hands on practice onVernierCalipers(03) | Findthe Leastcount<br>Fixthespecimeninposit<br>Read thescales<br>Calculate the physicalquantitiesofgive nobject | • Read thescales<br>• Calculate the requisitephysical quantities ofgivenobjects |
| 2. Hands on practice onScrewgauge(03) | Findthe Leastcount<br>Fixthespecimeninposit<br>Read thescales<br>Calculate thickness of glassplace and cross section ofwire andotherquantities | Read thescales<br>Calculatethicknessofgivenglassplate<br>Calculatecrosssectionofwireandotherquantities |
| 3.VerificationofParallelogramlawofforcesandTrianglelawofforces(03) | • Fixsuitableweights<br>• Note the positions ofthreadsondrawingsheet<br>• Find the angle atequilibriumpoint<br>• Constructparallelogram<br>• Comparethe measureddiagonal<br>• Constructtriangle<br>• Findthelengthofsides<br>• Comparethe ratios | • Findtheangleatequilibriumpoint<br>• Constructingparallelogram<br>• Constructtriangle<br>• Comparetheratiosofforceandlength |
| 4.Simplependulum(03) | • Fix the simple pendulum tothe stand<br>• Adjust the length ofpendulum<br>• Find the time for number ofoscillations<br>• Findthe time period<br>• Calculate the | • Find the time for numberofoscillations<br>• Findthe time period<br>• Calculate the accelerationdue togravity<br>• Drawl-T andl-$T^2$graph |

| | | |
|---|---|---|
| 5.Velocityofsoundinair –Resonance method (03) | • Arrange the resonance apparatus<br>• Adjust the reservoir level for booming sound<br>• Find the first and second resonanting lengths<br>• Calculate velocity of sound | • Adjust the reservoir level<br>• Find the first and second resonanting lengths<br>• Calculate velocity of sound at room temperature<br>• Calculatevelocityofs oundat$0^0$C |
| 6. Focal length and Focal power of convex lens (Separate & Combination)(03) | • Fix the object distance<br>• Find the Image distance<br>• Calculate the focal length and power of convex lens and combination of convex lenses<br>• Draw u-v and 1/u – 1/v graphs | • Calculate the focal length and power of convex lens<br>• Drawu-vand1/u–1/v graphs |
| 7. Refractive index of solid using traveling microscope(03) | • Find the least count of vernier on microscope<br>• Place the graph paper below microscope<br>• Read the scale<br>• Calculate the refractive index of glass slab | • Read the scale<br>• Calculate the refractive index of glasss lab |
| 8.Boyle's law verification (03) | • Note the atmospheric pressure<br>• Fix the quill tube to retort stand<br>• Find the length of air column<br>• Find the pressure of enclosed air<br>• Find and compare the calculated value P x l | • Find the length of air column<br>• Find the pressure of enclosed air<br>• Find the value Pxl |

| | | |
|---|---|---|
| 9.Meterbridge(03) | • Make the circuit connections<br>• Find the balancing length<br>• Calculate unknown resistance<br>• Find the radius of wire<br>• Calculate the specific resistance | • Find the balancing length<br>• Calculate unknown resistance<br>• Calculate the specific resistance |
| 10.Mapping of magnet lines of force(03) | • Draw magnetic meridian<br>• Placed the bar magnetic NN and NS directions<br>• Draw magnetic lines of force<br>• Locate the neutral points along equatorial and axial lines | • Draw magnetic lines of force<br>• Locate the neutral points along equatorial and axiallines |
| 11.Surfacetensionofliquidusingtravelingmicroscope(03) | • Find the least count of vernier on microscope<br>• Focus the microscope to the lower meniscus & bentpin<br>• Read the scale<br>• Calculate height of liquid rise<br>• Calculate the surface tension of water | • Read the scale<br>• Calculate height of liquid rise<br>• Calculate the surface tension of water |

| | | |
|---|---|---|
| 12..Coefficient of viscosity by capillary method(03) | • Find the least count of vernier<br>• Fix the capillary tube to aspiratory bottle<br>• Find the mass of collected water<br>• Find the pressure head<br>• Calculate rate of volume of liquid collected<br>• Find the radius of capillary tube<br>• Calculate the viscosity of water using capillary method | • Find the pressure head<br>• Calculate rate of volume of liquid collected<br>• Find the radius of capillary tube<br>• Calculate the viscosity of water |

***Scheme ofValuationforendLabPracticalExamination:***

**A. WritingAim,Apparatus, Formula,Graph,Precautionscarries10(Ten)Marks**

**B. ForDrawingthetable,takingReadings,Calculationwork, Drawingthegraph,findingresultcarries 15(Fifteen)Marks**

**C. VivaVoice 05(Five)Marks**

***Total 30(Thirty)Marks***

➢ **Courseoutcomes**

| | | |
|---|---|---|
| **Course Outcomes** | CO1 | ExperimentswithVerniercalipers,Screw gauge,Parallelogram lawand Trianglelaw |
| | CO2 | ExperimentswithSimplependulum,Resonanceapparatus(Velocityof soundin air ) |
| | CO3 | ExperimentswithConvexlens,Refractiveindexofsolidbytravelling microscope |
| | CO4 | Experimentswithquilltube (Boyleslawverification),Meterbridge, Mappingofmagnetic linesof force |
| | CO5 | ExperimentswithSurface tensionandViscosity |

➢ **COs-POmappingstrength(aspergiventable)**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | | | 1 | 1 | 1 | 1 |
| CO2 | 3 | 2 | 2 | | 1 | | |
| CO3 | 3 | | 2 | | | 1 | 2 |
| CO4 | 3 | 2 | | | 2 | | |
| CO5 | 3 | | 1 | 2 | | 1 | 2 |

3=stronglymapped 2=moderatelymapped

1=slightlymapped

**CHEMISTRY LABORATORY**

**(C-20 curriculum common to all Branches)**

| SubjectCode | SubjectTitle | Periodsperweek | Totalperiodsperyear |
|---|---|---|---|
| C -109B | Chemistry Laboratory | 03 | 45 |

| | |
|---|---|
| CO1 | Operate and practice volumetric apparatus and preparation of standard solution |
| CO2 | Evaluate and judge the neutralization point in acid base titration |
| CO3 | Evaluate the end point of reduction and oxidation reaction |
| CO4 | Judge the stable end point of complex formation, stable precipitation |
| CO5 | Judge operate and demonstrate and perform precise operations with instrument for investigation of water pollution parameters |

**PO CO mapping**

| **Course code C-109B** | **Chemistry Laboratory**<br>**No of Cos: 5** | | | | **No Of periods 45** |
|---|---|---|---|---|---|
| **POs** | **Mapped with CO No** | **CO periods addressing PO in Col 1 NO** | **%** | **Level 1,2,3** | **remarks** |
| PO1 | CO1,CO2,CO3, CO4,CO5 | 12 | 26.66 | 2 | >40% level 3 (highly addressed) 25% to 40% level2(moderately addressed 5% to 25% level1 (Low addressed < 5%(not addressed) |
| PO2 | CO1,CO2,CO3, CO4,CO5 | 9 | 20 | 1 | |
| PO3 | | | | | |
| PO4 | CO1,CO2,CO3, CO4,CO5 | 12 | 26.66 | 2 | |
| PO5 | CO2,CO3, CO4,CO5 | 12 | 26.66 | 2 | |
| PO6 | | | | | |
| PO7 | | | | | |

**COs-POs mapping strength (as per given table)**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | | 1 | | | | 1 | | |
| CO2 | 2 | 3 | | 2 | 2 | | | 1 | | |
| CO3 | 2 | 3 | | 2 | 2 | | | 1 | | |
| CO4 | 2 | 3 | | 2 | 2 | | | 1 | | |
| CO5 | 2 | 3 | | 2 | 2 | | | 1 | | |

3=strongly mapped

2= moderately mapped

1= slightly mapped

Note:

The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:

i) Seminars ii) Tutorials iii) Guest Lectures iv) Assignments v) Quiz competitions vi) Industrial visit vii) Tech Fest viii) Mini project ix) Group discussions x) Virtual classes xi) Library visit for e-books

**TIMESCHEDULE**

| S.No | Name of the Experiment | No.ofPeriods | Mapped with COs |
|---|---|---|---|
| 1. | a) Recognition of chemical substances and solutions used in the laboratory by senses.<br>b) Familiarization of methods for Volumetric analysis | 03 | CO1 |
| 2. | Preparation of Std $Na_2CO_3$ and making solutions of different dilution | 03 | CO1 |
| 3. | Estimation of HCl solution using Std.$Na_2CO_3$ solution | 03 | CO2 |
| 4. | Estimation of NaOH using Std.HCl solution | 03 | CO2 |
| 5. | Estimation of $H_2SO_4$usingStd.NaOH solution | 03 | CO2 |
| 6. | Estimation of Mohr's Salt using Std.$KMnO_4$ | 03 | CO3 |
| 7. | Determination of acidity of water sample | 03 | CO2 |
| 8. | Determination of alkalinity of water sample | 03 | CO2 |
| 9. | Determination of total hardness of water using Std.EDTA solution | 03 | CO4 |
| 10. | Estimation of Chlorides present in water sample | 03 | CO4 |
| 11. | Estimation of Dissolved Oxygen(D.O )in water sample | 03 | CO5 |
| 12. | Determination of pH using pH meter | 03 | CO5 |
| 13. | Determination of conductivity of water and adjusting ionic strength | 03 | CO5 |
| 14. | Determination of turbidity of water | 03 | CO5 |
| 15. | Estimation of total solids present in water sample | 03 | CO5 |
| | **Total:** | **45** | |

**Objectives:**

**Upon completion of the course the student shall be able to**

1.0 Practice volumetric measurements (using pipettes, measuring jars, volumetric flask, burettes) and gravimetric measurements (using different types of balances), making dilutions, etc. To identify the chemical compounds and solutions by senses.

2.0 Practice making standard solutions with pre weighed salts and to make solutions of desired dilutions using appropriate techniques.

3.0 Conduct titrations adopting standard procedures and using Std. $Na_2CO_3$solutionfor estimation of HCl

4.0 Conduct titrations adopting standard procedures and using Std. HCl solution for estimation of NaOH

5.0 Conduct titrations adopting standard procedures and using Std. NaOH solution for estimation of $H_2SO_4$

6.0 Conduct titrations adopting standard procedures and using Std.$KMnO_4$solution for estimation of Mohr'sSalt

7.0 Conduct titrations adopting standard procedures to determine the acidity of given samples of water (One ground water and one surface / tap water, and rain water if available)

8.0 Conduct titrations adopting standard procedures to determine the alkalinity of given samples of water (One ground water and one surface / tap water)

9.0 Conduct titrations adopting standard procedures to determine the total hardness of given samples of water (One ground water and one surface / tap water) using Std. EDTA solution

10.0 Conduct titrations adopting standard procedures to determine the chlorides present in the given samples of water and wastewater (One ground water and one surface / tap water)

11.0 Conduct the test using titrometric / electrometric method to determine Dissolved Oxygen (D.O) in given water samples (One sample from closed container and one from open container / tap water)

12.0 Conduct the test on given samples of water / solutions (like soft drinks, sewage, etc.) to determine their pH using standard pH meter

13.0 Conduct the test on given samples of water / solutions
a) To determine conductivity
b) To adjust the ionic strength of the sample to the desired value

14.0 Conduct the test on given samples of solutions (coloured and non coloured) to determine their turbidity in NTU

15.0 To determine the total solids present in given samples of water (One ground water and one surface / tap water)

**Competencies and Key competencies to be achieved by the student**

| Name of the Experiment (No of Periods) | Competencies | Key competencies |
|---|---|---|
| Familiarization of methods for Volumetric analysis. Recognition of chemical substances And solutions (03) | - | -- |
| Preparation of Std $Na_2CO_3$ and making solutions of different dilution(03) | ▪ Weighing the salt to the accuracy of .01 mg<br>▪ Measuring the water with volumetric flask, measuring jar, volumetric pipette and graduated pipette<br>▪ Making appropriate dilutions | ▪ Weighing the salt to the accuracy of .01 mg<br>▪ Measuring the water with volumetric flask, measuring jar, volumetric pipette and graduated pipette<br>▪ Making appropriate dilutions |
| Estimation of HCl solution using Std. $Na_2CO_3$solution (03) | ▪ Cleaning the glassware and rinsing with appropriate solutions<br>▪ Making standard solutions<br>▪ Measuring accurately the standard solutions and titrants<br>▪ Filling the burette with titrant<br>▪ Fixing the burette to the stand<br>▪ Effectively Controlling the flow of the titrant<br>▪ Identifying the end point<br>▪ Making accurate observations<br>▪ Calculating the results | ▪ Making standard solutions<br>▪ Measuring accurately the standard solutions and titrants<br>▪ Effectively Controlling the flow of the titrant<br>▪ Identifying the end point<br>▪ Making accurate observations |
| Estimation of NaOH using Std.HCl solution (03) | | |
| Estimation of $H_2SO_4$ using Std.NaOH solution (03) | | |
| Estimation of Mohr's Salt using Std.$KMnO_4$ (03) | | |
| Determination of acidity of water sample (03) | | |
| Determination of alkalinity of water sample (03) | | |
| Determination of total hardness of water using Std. EDTA solution (03) | | |
| Estimation of Chlorides present in water sample (03) | | |
| Estimation of Dissolved Oxygen(D.O) in water sample (By titration method) (03) | | |
| Determination of pH using pH meter (03) | ▪ Familiarize with instrument<br>▪ Choose appropriate 'Mode' / 'Unit' | ▪ Prepare standard solutions / buffers, etc.<br>▪ Standardize the |

| | | |
|---|---|---|
| Determination of conductivity of water and adjusting ionic strength to required level (03) | ▪ Prepare standard solutions / buffers, etc.<br>▪ Standardize the instrument with appropriate standard solutions<br>▪ Plot the standard curve<br>▪ Make measurements accurately<br>▪ Follow Safety precautions | instrument with appropriate standard solutions<br>▪ Plot the standard curve<br>▪ Make measurements accurately |
| Determination of turbidity of water (03) | | |
| Estimation of total solids present in water sample (03) | ▪ Measuring the accurate volume and weight of sample<br>▪ Filtering and air drying without losing any filtrate<br>▪ Accurately weighing the filter paper, crucible and filtrate<br>▪ Drying the crucible in an oven | ▪ Measuring the accurate volume and weight of sample<br>▪ Filtering and air drying without losing any filtrate<br>▪ Accurately weighing the filter paper, crucible and filtrate |

**SCHEME OF VALUATION**

A) Writing Chemicals, apparatus ,principle and procedure 5M

B) Demonstrated competencies 20M

Making standard solutions

Measuring accurately the standard solutions and titrants

Effectively controlling the flow of the titrant

Identifying the end point

Making accurate observations

C) Viva-voce 5M

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**Total** **30M**

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| Course code | Course Title | No. of Periods/Weeks | Total No. of periods | Marks for FA | Marks for SA |
|---|---|---|---|---|---|
| C-110 (common to all branches) | Computer Fundamentals Lab | 3 | 90 | 40 | 60 |

**Time schedule:**

| S.No. | Chapter/Unit Title | No. of sessions each of 3 periods duration | No.of Periods |
|---|---|---|---|
| 1. | Computer hardware Basics | 2 | 6 |
| 2. | Windows Operating System | 2 | 6 |
| 3. | MS Word | 8 | 24 |
| 4. | MS Excel | 7 | 21 |
| 5. | MS PowerPoint | 5 | 15 |
| 6. | Adobe Photoshop | 6 | 18 |
| | **Total periods** | **30** | **90** |

| S.No. | Chapter/Unit Title | No.of Periods | CO's Mapped |
|---|---|---|---|
| 1. | Computer hardware Basics | 6 | CO1 |
| 2. | Windows Operating System | 6 | CO1 |
| 3. | MS Word | 24 | CO2 |
| 4. | MS Excel | 21 | CO3 |
| 5. | MS PowerPoint | 15 | CO4 |
| 6 | Adobe Photoshop | 18 | CO5 |
| | **Total periods** | **90** | |

| | |
|---|---|
| **Course Objectives** | i)To know Hardware Basics<br>ii)To familiarize operating systems<br>iii)To use MS Office effectively to enable to students use these skills in future courses<br>iv) To use Adobe Photoshop in image editing. |

| | | | |
|---|---|---|---|
| **Course Outcomes** | At the end of the course students will be able to | | |
| | CO1 | C-110.1 | Identify hardware and software components |
| | CO2 | C-110.2 | Prepare documents with given specifications using word processing software |
| | CO3 | C-110.3 | Use Spread sheet software to make calculation and to draw various graphs / charts. |
| | CO4 | C-110.4 | Use Power point software to develop effective presentation for a given theme or topic. |
| | CO5 | C-110.5 | Edit digital or scanned images using Photoshop |

**CO-PO/PSO MATRIX**

| CO NO. | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| C-110.1 | **3** | **3** | **3** | **3** | **3** | **3** | **3** | **3** | **2** | **3** |
| C-110.2 | **3** | **3** | **3** | **3** | **3** | **3** | **3** | **3** | **2** | **3** |
| C-110.3 | **3** | **3** | **3** | **3** | **3** | **3** | **3** | **3** | **2** | **3** |
| C-110.4 | **3** | **3** | **3** | **3** | **3** | **3** | **3** | **3** | **2** | **3** |
| C-110.5 | **3** | **3** | **3** | **3** | **3** | **3** | **3** | **3** | **2** | **3** |
| **Average** | **3** | **3** | **3** | **3** | **3** | **3** | **3** | **3** | **2** | **3** |

**3=Strongly mapped , 2=moderately mapped, 1=slightly mapped**

**Learning Outcomes:**

**I. Computer Hardware Basics**

1. a).To Familiarize with Computer system and hardware connections
   b).To Start and Shut down Computer correctly
   c).To check the software details of the computer
2. To check the hardware present in your computer

**II. Windows's operating system**

3. To Explore Windows Desktop
4. Working with Files and Folders
5. Windows Accessories: Calculator – Notepad – WordPad – MS Paint

**III. Practice with MS-WORD**

6. To familiarize with Ribbon layout of MS Word
   Home – Insert- Page layout – References – Review- View.
7. To practice Word Processing Basics
8. To practice Formatting techniques
9. To insert a table of required number of rows and columns
10. To insert Objects, Clipart and Hyperlinks
11. To use Mail Merge feature of MS Word
12. To use Equations and symbols features

**IV.Practice with MS-EXCEL**

13. To familiarize with MS-EXCEL layout
14. To access and enter data in the cells
15. To edit a spread sheet- Copy, Cut, Paste, and selecting Cells
16. To use built in functions and Formatting Data
17. To create Excel Functions, Filling Cells
18. To enter a Formula for automatic calculations
19. To sort and filter data in table.
20. To present data using Excel Graphs and Charts.
21. To develop lab reports of respective discipline.
22. To format a Worksheet in Excel, Page Setup and Print

**V. Practice with MS-POWERPOINT**

23. To familiarize with Ribbon layout features of PowerPoint 2007.
24. To create a simple PowerPoint Presentation
25. To set up a Master Slide in PowerPoint
26. To insert Text and Objects
27. To insert a Flow Charts
28. To insert a Table
29. To insert a Charts/Graphs
30. To insert video and audio
31. To practice Animating text and objects
32. To Review presentation

**VI. Practice with Adobe Photoshop**

33.To familiarize with standard toolbox
34. To edit a photograph.
35. To insert Borders around photograph.

36. To change Background of a Photograph.
37. To change colors of Photograph.
38. To prepare a cover page for the book in your subject area.
39. To adjust the brightness and contrast of the picture so that it gives an elegant look.
40. To type a word and apply the shadow emboss effects.

**Key competencies:**

| Expt No | Name of Experiment | Competencies | Key competencies |
|---|---|---|---|
| 1 (a). | To familiarize with Computer system and hardware connections | **a.** Identify the parts of a Computer system: i). CPU ii). Mother Board iii) Monitor iv) CD/DVD Drive v) Power Switch vi) Start Button vii) Reset Button<br>b. Identify and connect various peripherals<br>c. Identify and connect the cables used with computer system<br>d. Identify various ports on CPU and connect Keyboard & Mouse | Connect cables to external hardware and operate the computer |
| 1 (b). | To Start and Shut down Computer correctly | a. Log in using the password<br>b. Start and shut down the computer<br>c. Use Mouse and Key Board | a. Login and logout as per the standard procedure<br>b. Operate mouse &Key Board |
| 1 (c). | To Explore Windows Desktop | a. Familiarize with Start Menu, Taskbar, Icons and Shortcuts<br>b. Access application programs using Start menu, Task manager<br>c. Use Help support | a. Access application programs using Start menu<br>b. Use taskbar and Task manager |
| 2. | To check the software details of the computer | a. Find the details of Operating System being used<br>b. Find the details of Service Pack installed | Access the properties of computer and find the details |
| 3. | To check the hardware present in your computer | a. Find the CPU name and clock speed<br>b. Find the details of RAM and Hard disk present<br>c. Access Device manager using Control Panel and check the status of devices like mouse and key board | a. Access device manager and find the details<br>b. Type /Navigate the correct path and Select icon related to the details |

| | | | |
|---|---|---|---|
| | | d. Use My Computer to check the details of Hard drives and partitions<br>e. Use the Taskbar | required |
| 4. | Working with Files and Folders | a. Create folders and organizing files in different folders<br>b. Use copy / paste move commands to organize files and folders | a. Create files and folders Rename , arrange and search for the required folder/file |
| | Working with Files and Folders Continued.... | c. Arrange icons – name wise, size, type, Modified<br>d. Search a file or folder and find its path<br>e. Create shortcut to files and folders (in other folders) on Desktop<br>f. Familiarize with the use of My Documents<br>g. Familiarize with the use of Recycle Bin | b. Restore deleted files from Recycle bin |
| 5. | To use Windows Accessories: Calculator – Notepad – WordPad – MS Paint | a. Familiarize with the use of Calculator<br>b. Access Calculator using Run command<br>c. Create Text Files using Notepad and WordPad and observe the difference in file size<br>d. Use MS paint and create .jpeg, .bmp files using MS Paint | a. Use windows accessories and select correct text editor based on the situation.<br><br>b. Use MS pain to create /Edit pictures and save in the required format. |
| 6. | To familiarize with Ribbon layout of MS word. – Home – Insert- page layout- References-Review-View | a. Create/Open a document<br>b. Use Save and Save as features<br>c. Work on two Word documents simultaneously<br>d. Choose correct Paper size and Printing options | a. Create a Document and name appropriately and save<br>b. Set paper size and print options |
| 7. | To practice Word Processing Basics | a. Typing text<br>b. Keyboard usage<br>c. Use mouse (Left click / Right click / Scroll)<br>d. Use Keyboard shortcuts<br>e. Use Find and Replace features in MS- word<br>f. Use Undo and Redo Features<br>g. Use spell check to correct Spellings and Grammar | a. Use key board and mouse to enter/edit text in the document.<br>b. Use shortcuts<br>c. Use spell check/ Grammar features for auto corrections. |

| | | | |
|---|---|---|---|
| 8. | To practice Formatting techniques | a. Formatting Text<br>b. Formatting Paragraphs<br>c. Setting Tabs<br>d. Formatting Pages<br>e. The Styles of Word<br>f. Insert bullets and numbers<br>g. Themes and Templates<br>h. Insert page numbers, header and footer | a. Format Text and paragraphs and use various text styles.<br>b. Use bullets and numbers to create lists<br>c. Use Templates /Themes<br>d. Insert page numbers date, headers and footers |
| 9. | To insert a table of required number of rows and columns | a. Edit the table by adding the fields – Deleting rows and columns –inserting sub table – marking borders. Merging and splitting of cells in a Table<br>b. Changing the background colour of the table<br>c. Use table design tools<br>d. Use auto fit – fixed row/ column height/length – Even distribution of rows / columns features<br>e. Convert Text to table and Table to Text<br>f. Use Sort feature of the Table to arrange data in ascending/descending order | a. Insert table in the word document and edit<br>b. Use sort option for arranging data. |
| 10. | To Insert objects, clipart and Hyperlinks | a. Create a 2-page document. &Insert hyperlinks and t Bookmarks.<br>b. Create an organization chart<br>c. Practice examples like preparing an Examination schedule notice with a hyperlink to Exam schedule table. | a. Insert hyperlinks &Bookmarks<br>b. Create organization charts/flow charts |
| 11. | To Use Mail merge feature of MS Word | a. Use mail merge to prepare individually addressed letters<br>b. Use mail merge to print envelopes. | Use Mail merge feature |
| 12. | To use Equations and symbols features. | a. Explore various symbols available in MS Word<br>b. Insert a symbol in the text | Enter Mathematical symbols and Equations in the word |

| | | | |
|---|---|---|---|
| | | c. Insert mathematical equations in the document | document |
| 13. | To Practice with MS-EXCEL | a. Open /create an MS Excel spreadsheet and familiarize with MS Excel 2007 layout like MS office Button-<br>b. Use Quick Access Toolbar-Title Bar- Ribbon-Worksheets-Formula Bar-Status Bar | a. Familiarize with excel layout and use<br>b. Use various features available in toolbar |
| 14. | To access and Enter data in the cells | a. Move Around a Worksheets-Quick access -Select Cells<br>b. Enter Data-Edit a Cell-Wrap Text-Delete a Cell Entry-Save a File-Close Excel | a. Access and select the required cells by various addressing methods<br>b. Enter data and edit |
| 15. | To edit spread sheet Copy, Cut, Paste, and selecting cells | a. Insert and Delete Columns and Rows-Create Borders-Merge and Center<br>b. Add Background Color-Change the Font, Font Size, and Font Color<br>c. Format text with Bold, Italicize, and Underline-Work with Long Text-Change a Column's Width | Format the excel sheet |
| 16. | To use built in functions and Formatting Data | a. Perform Mathematical Calculations verify -AutoSum<br>b. Perform Automatic Calculations-Align Cell Entries | Use built in functions in Excel |
| 17. | To enter a Formula for automatic calculations | a. Enter formula<br>b. Use Cell References in Formulae<br>c. Use Automatic updating function of Excel Formulae<br>d. Use Mathematical Operators in Formulae<br>e. Use Excel Error Message and Help | Enter formula for automatic calculations |
| 18. | To Create Excel Functions, Filling Cells | a. Use Reference Operators<br>b. Work with sum, Sum if , Count and Count If Functions<br>c. Fill Cells Automatically | a. Create Excel sheets involving cross references and equations |

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|---|---|---|---|
| | | | b. Use the advanced functions for conditional calculations |
| 19. | To sort and filter data in table | a. Sort data in multiple columns<br>b. Sort data in a row<br>c. Sort data using Custom order<br>d. Filter data in work sheet | a. Refine the data in a worksheet and keep it organized<br>b. Narrow a worksheet by selecting specific choice |
| 20. | To Practice Excel Graphs and Charts | a. Produce an Excel Pie Chart<br>b. Produce<br>c. Excel Column Chart | a. Use data in Excel sheet to Create technical charts and graphs Produce Excel Line Graph<br>b. Produce a Pictograph in Excel |
| 21. | To develop lab reports of respective discipline | Create Lab reports using MS Word and Excel | a. Insert Practical subject name in Header and page numbers in Footer |
| 22. | To format a Worksheet in Excel, page setup and print | a. Shade alternate rows of data<br>b. Add currency and percentage symbols<br>c. Change height of a row and width of a column<br>d. Change data alignment<br>e. Insert Headers and Footers<br>f. Set Print Options and Print | a. Format Excel sheet<br>b. Insert headers &footers and print |
| 23. | To familiarize with Ribbon layout &features of PowerPoint 2007. | Use various options in PowerPoint<br>a. Home<br>b. Insert<br>c. Design<br>d. Animation<br>e. Slideshow<br>f. View<br>g. Review | Access required options in the tool bar |
| 24. | To create a simple PowerPoint Presentation | a. Insert a New Slide into PowerPoint<br>b. Change the Title of a PowerPoint Slide<br>c. PowerPoint Bullets<br>d. Add an Image to a PowerPoint Slide | a. Create simple PowerPoint presentation with photographs/ClipArt and text boxes<br>b. Use bullets option |

| | | | |
|---|---|---|---|
| | | e. Add a Textbox to a PowerPoint slide | |
| 25. | To Set up a Master Slide in PowerPoint and add notes | a. Create a PowerPoint Design Template<br>b. Modify themes<br>c. Switch between Slide master view and Normal view<br>d. Format a Design Template Master Slide<br>e. Add a Title Slide to a Design Template<br>f. The Slide Show Footer in PowerPoint<br>g. Add Notes to a PowerPoint Presentation | a. Setup Master slide and format<br>b. Add notes |
| 26. | To Insert Text and Objects | a. Insert Text and objects<br>b. Set Indents and line spacing<br>c. Insert pictures/ clipart<br>d. Format pictures<br>e. Insert shapes and word art<br>f. Use 3d features<br>g. Arrange objects | Insert Text and Objects<br>Use 3d features |
| 27. | To insert a Flow Chart / Organizational Charts | a. Create a Flow Chart in PowerPoint<br>b. Group and Ungroup Shapes<br>c. Use smart art | Create organizational charts and flow charts using smart art |
| 28. | To insert a Table | a. PowerPoint Tables<br>b. Format the Table Data<br>c. Change Table Background<br>d. Format Series Legend | Insert tables and format |
| 29. | To insert a Charts/Graphs | a. Create 3D Bar Graphs in PowerPoint<br>b. Work with the PowerPoint Datasheet<br>c. Format a PowerPoint Chart Axis<br>d. Format the Bars of a Chart<br>e. Create PowerPoint Pie Charts<br>f. Use Pie Chart Segments<br>g. Create 2D Bar Charts in PowerPoint<br>h. Format the 2D Chart<br>e. Format a Chart Background | Create charts and Bar graphs, Pie Charts and format. |

| | | | |
|---|---|---|---|
| 30. | To Insert audio & video, Hyperlinks in a slide<br>Add narration to the slide | a. Insert sounds in the slide and hide the audio symbol<br>b. Adjust the volume in the settings<br>c. Insert video file in the format supported by PowerPoint in a slide<br>d. Use automatic and on click options<br>e. Add narration to the slide<br>f. Insert Hyperlinks | a. Insert Sounds and Video in appropriate format.<br>b. Add narration to the slide<br>c. Use hyperlinks to switch to different slides and files |
| 31. | To Practice Animation effects | a. Apply transitions to slides<br>b. To explore and practice special animation effects like Entrance, Emphasis, Motion Paths &Exit | Add animation effects |
| 32. | Reviewing presentation | a. Checking spelling and grammar<br>b. Previewing presentation<br>c. Set up slide show<br>d. Set up resolution<br>e. Exercise with Rehearse Timings feature in PowerPoint<br>f. Use PowerPoint Pen Tool during slide show<br>g. Saving<br>h. Printing presentation<br>(a) Slides<br>(b) Hand-out | a. Use Spell check and Grammar feature<br>b. Setup slide show<br>c. Add timing to the slides<br>d. Setup automatic slide show |
| 33 | To familiarize with standard toolbox | a. Open Adobe Photoshop<br>b. Use various tools such as<br>i. The Layer Tool<br>ii. The Color& Swatches Tool<br>iii. Custom Fonts & The Text Tool<br>iv. Brush Tool<br>v. The Select Tool<br>vi. The Move Tool<br>vii. The Zoom Tool<br>viii. The Eraser<br>ix. The Crop Tool<br>x. The Fill Tool | Open a photograph and save it in Photoshop |

| | | | |
|---|---|---|---|
| 34 | To edit a photograph | a. Use the Crop tool<br>b. Trim edges<br>c. Change the shape and size of a photo<br>d. Remove the part of photograph including graphics and text | a. Able to edit image by using corresponding tools. |
| 35 | To insert Borders around photograph | a. Start with a single background layer<br>b. Bring the background forward<br>c. Enlarge the canvas<br>d. Create a border color<br>e. Send the border color to the back<br>f. Experiment with different colors | Able to create a border or frame around an image to add visual interest to a photo |
| 36 | To change Background of a Photograph | a. open the foreground and background image<br>b. Use different selection tools to paint over the image<br>c. Copy background image and paste it on the foreground.<br>d. Resize and/or drag the background image to reposition.<br>e. In the Layers panel, drag the background layer below the foreground image layer. | Able to swap background elements using the Select and Mask tool and layers. |
| 37 | To change colors of Photograph | a. Change colors using:<br>i) Color Replacement tool<br>ii) Hue/Saturation adjustment layer tool | Able to control color saturation |
| 38 | To prepare a cover page for the book in subject area | a. open a file with height 500 and width 400 for the cover page.<br>b. apply two different colors to work area by dividing it into two parts using Rectangle tool.<br>c. Copy any picture and place it on work area→ resize it using free transform tool.<br>d. Type text and apply color and style<br>e. Apply effects using blended options | Able to prepare cover page for the book |

| | | | |
|---|---|---|---|
| 39 | To adjust the brightness and contrast of picture to give an elegant look | a. open a file.<br>b. Go to image→ adjustments→ Brightness/Contrast.<br>c. adjust the brightness and contrast.<br>d. Save the image. | Able to control brightness/contrast. |
| 40 | To type a word and apply the shadow emboss effects | a. open a file<br>b. Select the text tool and type text.<br>c. Select the typed text go to layer→ layer style→ blended option→ drop shadow, inner shadow, bevel and emboss→ contour→ satin→ gradient overlay<br>d. Save the image. | Able to apply shadow emboss effects |

**Table specifying the scope of syllabus to be covered for unit tests**

| Unit Test | Learning outcomes to be covered |
|---|---|
| Unit test-1 | From 1 to 8 |
| Unit test-2 | From 9 to 22 |
| Unit test-3 | From 23 to 40 |

**I Year Internal Lab Examination**
**UNIT TEST - I**
**MODEL QUESTION PAPER**
**COMPUTER FUNDAMENTALS LAB**

**SCHEME: C-20** **SUBJ CODE: C-110**
**MAX MARKS:40** **TIME:90MIN**

1. Identify the internal hardware components of a PC and assemble them.
2. Identify the external components or peripherals of a PC and connect them.
3. Identify the components on motherboard.
4. Perform the process of placing processor on CPU slot.
5. Perform the process of removing and placing the RAM in the corresponding slot.
6. Identify the CMOS battery and test whether it is working it or not.
7. Find details of following:

   a) Operating System being used.

   b) Processor name

   c) RAM

   d) Hard disk
8. Create a folder by your name, search a file or folder and find its path.
9. Draw the National Flag using MS Paint.
10. Create a word document that contains TEN names of your classmates (boys-5 & girls-5) and perform the following tasks:

    a) Save the document to your desktop.

    b) Sort the names in each list alphabetically.

    c) Set line spacing to 1.15.

    d) Use bullet points for the names in both lists separately.

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**I Year Internal Examination**
**UNIT TEST - II**
**MODEL QUESTION PAPER**
**COMPUTER FUNDAMENTALS LAB**

**SCHEME: C-20** **SUBJ CODE:CM-110**
**MAX MARKS:40** **Time:90Min**

1. Write individually addressed letters to your friends about the Republic Day celebration using Mail Merge.
2. Create a Word document about your college and insert page numbers in footer and College Name in header.
3. Create your class time table using Tables in MS Word.
4. Create a 2-page document about your College& insert hyperlinks for courses offered in the college and insert Bookmarks next to College Name.
5. Write individually addressed letters to your friends (at least 5 members) to intimate the External Examination time table using Mail Merge.
6. Write an equation $\frac{(x+y)^2}{(x-y)^2} = \frac{x^2+2xy+y^2}{x^2-2xy+y^2}$ in MS word.
7. Create the organizational structure of your college in MS Word.
8. Create a spreadsheet by totaling marks of 3 or more subjects, then calculate percentage and hence find grade based on boundary conditions of FIVE students:
   Grades O >= 90%, A >=80%, B >=70%, C >=60%, D >=50%, E >=40%, F <40%
9. Create a Excel spreadsheet for the following data, making sure that the cell marked with Category (A1) is pasted in cell A1 in the spreadsheet and perform the questions below.

| Category (A1) | Product Name | Quantity | Inventory | Price per Unit | Total Price |
|---|---|---|---|---|---|
| Office Supplies | Binder | 2 | 20 | 12.99 | 25.98 |
| Office Supplies | Pencil | 20 | 20 | 0.99 | |
| Electronics | Samsung 4K Smart TV | 1 | 5 | 399.00 | |
| Electronics | Bluetooth Speakers | 4 | 5 | 44.49 | |
| Computers | Lenovo X230 12in Laptop | 2 | 2 | 279.90 | |

   a). Change the format of the “Total Price” column to “Currency” format.
   b) Calculate Total Price by writing formula.
   c) Turn on filtering for the table.
   d) Sort the table by column “Category” from A to Z.
10. Create a spreadsheet to calculate Cumulative monthly attendance for a period of Three months.

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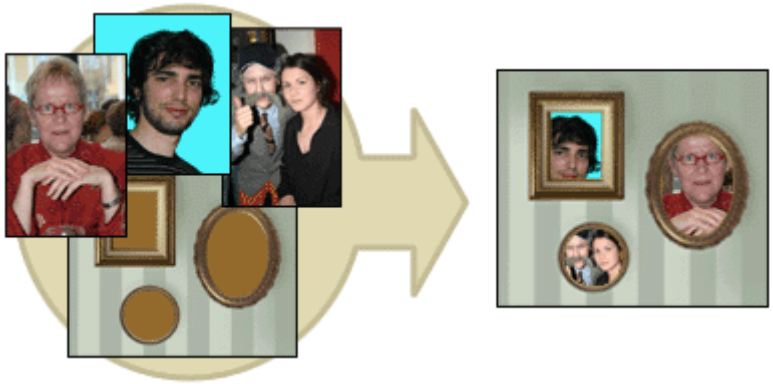
**Year Internal Lab Examination**
**UNIT TEST - III**
**MODEL QUESTION PAPER**
**COMPUTER FUNDAMENTALS LAB**

**SCHEME: C-20** **SUBJ CODE: COMMON-110**

**MAX MARKS:40** **Time:90Min**

1. Create a PowerPoint Presentation about your College in 5 slides only.
2. Create a PowerPoint Presentation on Computer Hardware in minimum 5 slides.
3. Create a PowerPoint Presentation on Computer Fundamentals with *Entrance, Emphasis* effects in minimum 5 slides.
4. Create a PowerPoint Presentation on any topic with special animation effects like *Entrance, Motion Paths &Exit.*
5. Resize the image using Photoshop.
6. Change the background of a Photograph.
7. Edit an image by using
   a) Crop tool.
   b) Resize the image
   c) Save the new image with new name keeping original image as it is.
8. A Picture of two parrots (parrots.jpg) is given to you. Make anyone of one of the parrots in Black & White.
9. Convert a colour image to monochrome and improve quality of photograph.
10. Copy three pictures and fit into the empty frames.



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BOARD DIPLOMA EXAMINATIONS
DIPLOMA IN COMPUTER ENGINEERING
**MODEL PRACTICAL QUESTION PAPER-YEAR END EXAM**
**COMPUTER FUNDAMENTALS LAB**

**SCHEME: C-20** **SUBJ CODE:CM-110**

**MAX MARKS:60** **IME: 3HOURS**

1. Identify the internal hardware components of a PC and assemble them.
2. Identify the external components or peripherals of a PC and connect them.
3. Write the procedure to create the files and folders
4. Write the procedure to access Calculator, Paint and Notepad application
5. Write the procedure to perform the following in MS Word
   (a) Change the Font Size
   (b) Change the Font Style
   (c) Change the Text Size
6. Write the procedure to perform the following in MS Word
   (a) Change the Font Colour.
   (b) Use Various Text Alignment Options.
   (c) Format text in Bold, Italic and Underline.
7. Create the hierarchy of your family in MS Word.
8. Write the procedure to perform the following in MS Word:
   (a) Insert a Table
   (b) Add a Row
   (c) Add a column
   (d) Delete a Row
   (e) Delete a column
9. Write the procedure to use Equation $\frac{(x+y)^2}{(x-y)^2} = \frac{x^2+2xy+y^2}{x^2-2xy+y^2}$ and Symbols.
10. Write the procedure to perform the following in MS Excel
    (a) To Modify Column Width
    (b) To Modify Row Height

(c) Format text in Bold, Italic, and Underline.

11. Write the procedure to create charts and Graphs in MS Excel.
12. Write the procedure to create simple Power Point Presentation on your college in Three slides.
13. Write the procedure to perform Animation on Text and Objects in your presentation.

14. Take a photographic image. Give a title for the image. Put the border. Write your names. Write the Name of Institution and Place.
15. Prepare a cover page for the book in your subject area. Plan your own design.
16. You are given a picture of a flower and associated background (Extract.jpg).Extract the Flower only from that and organize it on a background. Select your own background for organization.
17. You are given a picture (BrightnessContrast.jpg). Adjust the brightness and contrast of the picture so that it gives an elegant look.
18. You are given a picture (position.jpg). Position the picture preferably on a plain background of a colour of your choice - Positioning include rotation and scaling.
19. Remove the arrows and text from the given photographic image(Filename: photo.jpg).
20. Type a word; apply the following effects. Shadow Emboss.

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# III SEMESTER

**DIPLOMA IN CIVIL ENGINEERING**
**SCHEME OF INSTRUCTION AND MODEL BLUE PRINT FOR EVALUATION**
**CURRICULUM-2020**
**THIRD SEMESTER**

| Sub Code | Name of the Subject | Instruction Periods/Week | | Total Periods Per Year | Scheme Of Examination | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | | Duration (hrs) | Sessional Marks | End Exam Marks | Total Marks |
| **THEORY** | | | | | | | | |
| **C-301** | Engineering Mathematics –II | 4 | | 60 | 3 | 20 | 80 | 100 |
| **C-302** | Mechanics of Solids & Theory of Structures | 5 | | 75 | 3 | 20 | 80 | 100 |
| **C-303** | Hydraulics | 5 | | 75 | 3 | 20 | 80 | 100 |
| **C-304** | Surveying-II | 4 | | 60 | 3 | 20 | 80 | 100 |
| **C-305** | Construction Materials | 4 | | 60 | 3 | 20 | 80 | 100 |
| **C-306** | Construction Practice | 4 | | 60 | 3 | 20 | 80 | 100 |
| **PRACTICAL** | | | | | | | | |
| **C-307** | Civil Engineering Drawing-I | - | 6 | 90 | 3 | 40 | 60 | 100 |
| **C-308** | Surveying - II Practice & Plotting | - | 4 | 60 | 3 | 40 | 60 | 100 |
| **C-309** | Material Testing Practice | - | 3 | 45 | 3 | 40 | 60 | 100 |
| **C-310** | Hydraulics Practice | - | 3 | 45 | 3 | 40 | 60 | 100 |
| | **Total** | **26** | **16** | **630** | | **280** | **720** | **1000** |

**ENGINEERING MATHEMATICS-II**

| Course Code | Course Title | No. of Periods/week | Total No. of periods | Marks for FA | Marks for SA |
|---|---|---|---|---|---|
| C-301 | Engineering Mathematics-II | 4 | 60 | 20 | 80 |

| S.No. | Unit Title | No. of periods | COs mapped |
|---|---|---|---|
| 1 | Indefinite Integration | 22 | CO1 |
| 2 | Definite Integration and its applications | 24 | CO2 |
| 3 | Differential Equations of first order | 14 | CO3 |
| | **Total Periods** | **60** | |

| | |
|---|---|
| **Course Objectives** | (i) To understand the concepts of indefinite integrals and definite integrals with applications to engineering problems.<br>(ii) To understand the formation of differential equations and learn various methods of solving them. |

| | | |
|---|---|---|
| **Course Outcomes** | CO1 | Integrate various functions using different methods. |
| | CO2 | Evaluate definite integrals with applications. |
| | CO3 | Obtain differential equations and solve differential equations of first order and first degree. |

**ENGINEERING MATHEMATICS – II**

**Learning Outcomes**

**Unit-I**

**C.O. 1 Integrate various functions using different methods.**

**L.O.** 1.1. Explain the concept of Indefinite integral as an anti-derivative.

1.2. State the indefinite integral of standard functions and properties of Integrals $\int (u + v)\,dx$ and $\int ku\,dx$ where $k$ is constant and $u, v$ are functions of $x$.

1.3. Solve integration problems involving standard functions using the above rules.

1.4. Evaluate integrals involving simple functions of the following type by the method of substitution.

i) $\int f(ax + b)\,dx$ where $f(x)dx$ is in standard form.

ii) $\int [f(x)]^n f'(x)\,dx$

iii) $\int f'(x)/[f(x)]\,dx$

iv) $\int f\{g(x)\}\,g'(x)\,dx$

1.5. Find the integrals of *tan x, cot x, sec x* and *cosec x* using the above.

1.6. Evaluate the integrals of the form $\int \sin^m x \cos^n x\,dx$ where m and n are suitable positive integers.

1.7. Evaluateintegrals of suitable powers of *tan x* and *sec x*.

1.8. Evaluate the Standard integrals of the functions of the type

$$i)\ \frac{1}{a^2+x^2}, \frac{1}{a^2-x^2}, \frac{1}{x^2-a^2}$$

$$ii)\ \frac{1}{\sqrt{a^2+x^2}}, \frac{1}{\sqrt{a^2-x^2}}, \frac{1}{\sqrt{x^2-a^2}}$$

$$iii)\ \sqrt{x^2-a^2}, \sqrt{x^2+a^2}, \sqrt{a^2-x^2}$$

1.9. Evaluate the integrals of the type

$$\int \frac{1}{a+bSin\theta}d\theta, \int \frac{1}{a+b\cos\theta}d\theta \text{ and } \int \frac{1}{a\cos\theta+b\sin\theta+c}d\theta.$$

1.10. Evaluate integrals using decomposition method.

1.11. Solve problems using integration by parts.

1.12 Use Bernoulli's rule for evaluating the integrals of the form $\int u.v\,dx$.

1.13. Evaluate the integrals of the form $\int e^x [f(x) + f'(x)]\,dx$.

**Unit-II**

**C.O.2 Evaluate definite integrals with applications.**

L.O. 2.1. State the fundamental theorem of integral calculus

2.2. Explain the concept of definite integral.

2.3. Solve problems on definite integrals over an interval using the above concept.

2.4. State various properties of definite integrals.

2.5. Evaluate simple problems on definite integrals using the above properties.

Syllabus for Unit test-I completed

2.6. Explain definite integral as a limit of sum by considering an area.

2.7. Find the areas under plane curves and area enclosed between two curves using integration.

2.8. Obtain the mean value and root mean square value of the functions in any given interval.

2.9. Obtain the volumes of solids of revolution.

2.10. Solve some problems using Trapezoidal rule, Simpson's 1/3 rule for approximation of integrals.

**Unit -III**

**C.O. 3 Form differential equations and solve differential equations of first order and first degree.**

**L.O.** 3.1 Define a Differential equation, its order and degree

3.2 Find order and degree of a given differential equation.

3.3 Form a differential equation by eliminating arbitrary constants.

3.4 Solve the first order and first degree differential equations by variables separable method.

3.5 Solve Homogeneous differential equation of first order and first degree.

3.6 Solve exact differential equation of first order and first degree.

3.7 Solve linear differential equation of the form $dy/dx + Py = Q$, where P and Q are functions of x or constants.

3.8 Solve Bernoulli's differential equation reducible to linear form.

3.9 Solve simple problems arising in engineering applications.

Syllabus for Unit test-II completed

**C-20**

**Engineering Mathematics – II**

**CO/PO – Mapping**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PSO1** | **PSO2** | **PSO3** |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 2 | | | | 3 | 1 | 2 |
| CO2 | 3 | 3 | 3 | 3 | | | | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | | | | 3 | 3 | 3 |
| Avg | 3 | 2.6 | 2.6 | 2.6 | | | | 3 | 2.3 | 2.6 |

**3 =** Strongly mapped (High), **2 =** Moderately mapped (Medium), **1 =** Slightly mapped (Low)

**PO5:** Appropriate quiz programme may be conducted at intervals and duration as decided by concerned teacher.

**PO6:** Seminars on applications of mathematics in various engineering disciplines are to be planned and conducted.

**PO7:** Such activities are to be planned that students visit library to refer standard books on Mathematics and latest updates in reputed national and international journals, attending seminars, learning mathematical software tools.

**PSO1:** An ability to understand the concepts of basic mathematical techniques and to apply them in various areas like computer programming, civil constructions, fluid dynamics, electrical and electronic systems and all concerned engineering disciplines.

**PSO2:** An ability to solve the Engineering problems using latest software tools, along with analytical skills to arrive at faster and appropriate solutions.

**PSO3:** Wisdom of social and environmental awareness along with ethical responsibility to have a successful career as an engineer and to sustain passion and zeal for real world technological applications.

**Engineering Mathematics – II**

**PO- CO – Mapping strength**

| PO no | Mapped with CO no | CO periods addressing PO in column I | | Level (1,2 or 3) | Remarks |
|---|---|---|---|---|---|
| | | Number | % | | |
| 1 | CO1, CO2, CO3 | 60 | 100% | 3 | >40% Level 3 Highly addressed<br><br>25% to 40% Level 2 Moderately addressed<br><br>5% to 25% Level 1 Low addressed<br><br><5% Not addressed |
| 2 | CO1, CO2, CO3 | 60 | 100% | 3 | |
| 3 | CO1, CO2, CO3 | 60 | 100% | 3 | |
| 4 | CO2, CO3 | 38 | 63.3% | 3 | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| PSO 1 | CO1, CO2, CO3 | 60 | 100% | 3 | |
| PSO 2 | CO1, CO2, CO3 | 40 | 66.6% | 3 | |
| PSO 3 | CO1, CO2, CO3 | 48 | 75% | 3 | |

**ENGINEERING MATHEMATICS – II**

**COURSE CONTENTS**

**Unit-I**

**Indefinite Integration.**

**1.** Integration regarded as anti-derivative – Indefinite integrals of standard functions. Properties of indefinite integrals. Integration by substitution or change of variable. Integrals of tan x, cot x, sec x, cosec x. Integrals of the form $\int \sin^m x.\cos^n x\,dx$, where at least one of m and n is odd positive integers. Integrals of suitable powers of tanx. secx and cosecx.cotx by substitution.

Evaluation of integrals which are reducible to the following forms:

$$i)\ \frac{1}{a^2+x^2}, \frac{1}{a^2-x^2}, \frac{1}{x^2-a^2}$$

$$ii)\ \frac{1}{\sqrt{a^2+x^2}}, \frac{1}{\sqrt{a^2-x^2}}, \frac{1}{\sqrt{x^2-a^2}}$$

$$iii)\ \sqrt{x^2-a^2}, \sqrt{x^2+a^2}, \sqrt{a^2-x^2}$$

Integration by decomposition of the integrand into simple rational, algebraic functions.

Integration by parts, Bernoulli's rule and integrals of the form $\int e^x [f(x) + f'(x)]\,dx$.

**Unit-II**

**Definite Integral and its applications:**

2. Definite integral-fundamental theorem of integral calculus, properties of definite integrals, evaluation of simple definite integrals. Definite integral as the limit of a sum. Area under plane curves – Area enclosed between two curves. Mean and RMS values of a function on a given interval Volumes of solids of revolution. Trapezoidal rule, Simpson's 1/3 rule to evaluate an approximate value of a define integral.

**Unit -III**

**Differential Equations:**

3. Definition of a differential equation-order and degree of a differential equation- formation of differential equations-solutions of differential equations of first order and first degree using methods, variables separable, homogeneous, exact, linear differential equation, Bernoulli's equation.

**Textbook:**

Engineering Mathematics-II, a textbook for third semester diploma courses, prepared & prescribed by SBTET, AP.

**Reference Books:**


1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Schaum's Outlines Differential Equations, Richard Bronson & Gabriel B. Costa
3. M.Vygodsky, Mathematical Handbook: Higher Mathematics, Mir Publishers, Moscow.

**BLUE PRINT**

| S. No | Chapter/Unit title | No of Periods | Weightageallotted | Marks wise distribution of weightage | | | | Questionwise distributionof weightage | | | | COs mapped |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | R | U | Ap | An | R | U | Ap | An | |
| 1 | Unit – I: Indefinite Integration | 22 | 28 | 11 | 11 | 06 | 0 | 2 | 2 | 2 | 0 | CO1 |
| 2 | Unit – II: Definite Integration and its applications | 24 | 33 | 11 | 03 | 11 | 08 | 2 | 1 | 2 | 1 | CO2 |
| 3 | Unit – III: Differential Equations of first order | 14 | 19 | 03 | 03 | 03 | 10 | 1 | 1 | 1 | 1 | CO3 |
| **Total** | | **60** | **80** | **25** | **17** | **20** | **18** | **5** | **4** | **5** | **2** | |

**R: Remembering Type : 25 Marks**
**U: understanding Type : 17 Marks**
**Ap: Application Type : 20 Marks**
**An: Analysing Type : 18 Marks**

**Engineering Mathematics – II**
**Unit Test Syllabus**

| Unit Test | Syllabus |
|---|---|
| Unit Test-I | From L.O 1.1 to L.O 2.5 |
| Unit Test-II | FromL.O 2.6 to L.O 3.9 |

**UNIT TEST MODEL PAPERS**

**Unit Test I** **C –20, C-301**

**State Board of Technical Education and Training, A. P**

**First Year**

**Subject name: Engineering Mathematics-II**

**Sub Code: C-301**

**Time : 90 minutes** **Max.Marks:40**

**Part-A** **16Marks**

***Instructions:*** **(1) Answer all questions.**

**(2) First question carries four marks and the remaining questions carry three marks each.**

1. Answer the following.

Evaluate $\int x^8 dx$ (CO1)

Evaluate $\int \frac{1}{\sqrt{4-x^2}} dx.$ (CO1)

$\int e^x \left( f(x) + f'(x) \right) dx = e^x f(x) + c$ is true/false (CO1)

a. Evaluate $\int_0^{\frac{\pi}{2}} \cos x dx$ (CO2)

2. Evaluate $\int \left( 3\cos ec^2 x - 2\tan x \sec x + \frac{1}{x} \right) dx.$ (CO1)

3. Evaluate $\int \frac{\sin(\log x)}{x} dx.$ (CO1)

4. Evaluate $\int e^x \sin 2x dx.$ (CO1)

5. Evaluate $\int_0^{\frac{\pi}{2}} \sin^2 x dx$ (CO2)

**Part-B** **3×8=24**

***Instructions:*** **(1) Answer all questions.**

**(2) Each question carries eight marks**

**(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. A) Evaluate $\int \frac{1}{5+4\cos x} dx.$ (CO1)

or

B) Evaluate $\int \sin^4 x \cos^3 x dx.$ (CO1)

7. A) Evaluate $\int \cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)dx.$ (CO1)

or

B) Evaluate $\int x^4 e^{2x} dx.$ (CO1)

8. A) Evaluate $\int_0^{\frac{\pi}{2}} \cos 4x \cos x dx$ (CO2)

or

B) Evaluate $\int_0^{\frac{\pi}{2}} \frac{\sin^{10} x}{\sin^{10} x + \cos^{10} x} dx$ (CO2)

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**Unit Test II** **C –20, C-301**

**State Board of Technical Education and Training, A. P**

**First Year**

**Subject name: Engineering Mathematics-II**

**Sub Code: C-301**

**Time : 90 minutes** **Max.Marks:40**

**Part-A** **16Marks**

***Instructions:*** **(1) Answer all questions.**
**(2) First question carries four marks and the remaining questions carry three marks each.**

1. Answer the following.

   a. Volume of the curve $y = f(x)$ over the interval $[a,b]$ when rotated about X-axis is _____ (CO2)

   b. Mean value of $f(x)$ over the interval $[a,b]$ is_____ (CO2)

   c. Order of differential equation $\frac{d^2y}{dx^2} + p^2y = 0$ is_____ (CO3)

   d. Integrating factor of $\frac{dy}{dx} + Py = Q$ is_____ (CO3)

2. Find the mean value of $x^2 + 2x + 1$ over the interval $[1,2]$ (CO2)

3. Find the area enclosed by curve $x^2 = 4y$ between the lines $x = 2$ and $x = 4$ (CO2)

4. Form the differential equation by eliminating the arbitrary constants from

   $y = A\cos 2x + B\sin 2x.$ (CO3)

5. Solve $\frac{dy}{dx} = \sqrt{\frac{1-y^2}{1-x^2}}.$ (CO3)

**Part-B** **3×8=24**

***Instructions:*** **(1) Answer all questions.**
**(2) Each question carries eight marks**
**(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. A) Find the area bounded between the curve $y = x^2 - 5x$ and the line $y = 4 - 2x$ (CO2)

   Or

   B) Find the R.M.S value of $\sqrt{\log x}$ between the lines $x = e$ to $x = e^2$ (CO2)

7. A) Find the volume of the solid obtained by revolving the ellipse $\frac{x^2}{16}+\frac{y^2}{25}=1$ about x axis (CO2)

or

B) Calculate the approximate value of $\int_0^6 \frac{1}{1+x}\,dx$ by taking $n=6$ using Trapezoidal rule (CO3)

8. A) Solve $\left(y^2-2xy\right)dx+\left(2xy+x^2\right)dy=0.$ (CO3)

or

B) Solve $x\frac{dy}{dx}+\frac{y}{x}=x^3y^6.$ (CO3)

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**END EXAM MODEL PAPERS**

**STATE BOARD OF TECHNICAL EDUCATION, A.P**

**ENGINEERING MATHEMATICS C-301**

**TIME : 3 HOURS** **MODEL PAPER- I** **MAX.MARKS : 80M**

**PART-A**

**Answer All questions. Each question carries THREE marks.** **10x3=30M**

1. Evaluate $\int\left(2\sin x-3e^{x}+\frac{4}{1+x^{2}}\right)dx.$ **CO1**
2. Evaluate $\int e^{x}\sin e^{x}dx.$ **CO1**
3. Evaluate $\int \sin 3x\cos 2xdx.$ **CO1**
4. Evaluate $\int xe^{x}dx.$ **CO1**
5. Evaluate $\int_{0}^{1}\frac{1}{1+x^{2}}dx.$ **CO2**
6. Find the mean value of $y=x^{2}$ from $x=0$ to $x=1$ **CO2**
7. Find the area of the region bounded by the curve $y=\sin x$ from $x=0$ to $x=\pi$ **CO2**
8. Find the order and degree of the differential equation $\left(\frac{d^{3}y}{dx^{3}}\right)^{2}-3\left(\frac{dy}{dx}\right)^{2}-x^{2}=1$ **CO3**
9. Solve $\frac{dy}{dx}=\frac{1+y^{2}}{1+x^{2}}$ **CO3**
10. Solve $\left(x^{2}+y\right)dx+\left(y^{2}+x\right)dy=0.$ **CO3**

**PART-B**

**Answer All questions. Each question carries EIGHT marks.** **5x8=40M**

11. A) Evaluate $\int\frac{3x+1}{(x-1)(x+3)}dx.$ **CO1**

Or

B) Evaluate $\int\frac{1}{5+4\cos x}dx.$ **CO1**

12. A) Evaluate $\int x\sin 3xcosxdx.$ **CO1**

Or

B) Evaluate $\int x^{3}\cos xdx.$ **CO1**

13. A) Evaluate $\int_0^1 \frac{x^3}{1+x^8}dx.$ **CO2**

Or

B) Evaluate $\int_0^{\frac{\pi}{2}} \frac{1}{1+\tan^3 x}dx.$ **CO2**

14. A) Find the area of the region bounded by the curves $y^2 = 4x$ **and** $x^2 = 4y$. **CO2**

Or

B) Find the R.M.S values of $\sqrt{27-4x^2}$ from $x=0$ to $x=3$ **CO2**

15. A) Find the volume of the solid generated by revolution of the ellipse $\frac{x^2}{16}+\frac{y^2}{25}=1$ about X-axis **CO2**

Or

B) Calculate the approximate value of $\int_1^{11} x^3 dx$ by using Simpson's 1/3rd rule by dividing the range into 10 equal parts. **CO2**

**PART-C**

**Answer the following question. Question carries TEN marks.** **1x10=10M**

16. Solve $2\sin x\frac{dy}{dx} - y\cos x = xy^3e^x.$ **CO3**

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**STATE BOARD OF TECHNICAL EDUCATION, A.P**

**ENGINEERING MATHEMATICS C- 301**

**TIME : 3 HOURS** **MODEL PAPER-II** **MAX.MARKS : 80M**

**PART-A**

**Answer All questions. Each question carries THREE marks.** **10x3=30M**

1. Evaluate $\int\left(3e^{x}-2\cos x+\frac{3}{x}\right)dx.$ **CO1**

2. Evaluate $\int\cos^{2}2xdx.$ **CO1**

3. Evaluate $\int\frac{\tan^{-1}x}{1+x^{2}}dx.$ **CO1**

4. Evaluate $\int x\cos xdx.$ **CO1**

5. Evaluate $\int_{0}^{2}\frac{1}{\sqrt{4-x^{2}}}dx.$ **CO2**

6. Find the mean value of $i=a\sin t$ over the complete wave. **CO2**

7. Find the volume generated by revolving the circle $x^{2}+y^{2}=9$ from $x=0$ to $x=2$ about x-axis **CO2**

8. Obtain the differential equation by eliminating the arbitrary constants A and B from the curve $y=Ae^{x}+Be^{-x}$ **CO3**

9. Solve $\frac{dy}{dx}=e^{2x+y}$ **CO3**

10. Solve $\frac{dy}{dx}+\frac{y}{x}=x$ **CO3**

**PART-B**

**Answer All questions. Each question carries EIGHT marks.** **5x8=40M**

11. A) Evaluate $\int\frac{1}{2x^{2}+3x+5}dx.$ **CO1**

Or

B) Evaluate $\int\sin^{3}x\cos^{5}xdx.$ **CO1**

12. A) Evaluate $\int e^{x}\left(\frac{2+\sin 2x}{1+\cos 2x}\right)dx.$ **CO1**

Or

B) Evaluate $\int e^{2x}x^{4}dx.$ **CO1**

13. A) Evaluate $\int_0^1 \frac{\sec^2 x}{(1+\tan x)^2} dx.$ **CO2**

Or

B) Evaluate $\int_0^{\frac{\pi}{2}} \log(1+\tan\theta)\, d\theta.$ **CO2**

14. A) Find the area bounded between the curves $y = x^2$ and the line $y = 3x + 4$. **CO3**

Or

B) Find the R.M.S value of $\sqrt{\log x}$ between the lines $x = e$ to $x = e^2$ **CO2**

15. A) Find the volume of right circular cone using integration. **CO2**

Or

B) Find the approximate value of $\pi$ from $\int_0^1 \frac{1}{1+x^2} dx$ using Trapezoidal rule by dividing $[0,1]$ into 5 equal sub-intervals. **CO2**

**PART-C**

**Answer the following question. Question carries TEN marks. 1x10=10M**

16. Solve $xy^2 dy - (x^3 + y^3) dx = 0$ **CO3**

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# MECHANICS OF SOLIDS AND THEORY OF STRUCTURES

| Course Code | Course Title | No. of Periods per Week | Total No. of Periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-302 | MECHANICS OF SOLIDS AND THEORY OF STRUCTURES | 05 | 75 | 20 | 80 |

| S.No. | Major Topics | No. of Periods | COs Mapped |
|---|---|---|---|
| 1. | Theory of simple bending | 15 | CO1 |
| 2. | Deflection of beams | 15 | CO2 |
| 3. | Columns and Struts | 10 | CO3 |
| 4. | Dams and Retaining walls | 15 | CO3 |
| 5. | Statically indeterminate beams | 10 | CO4 |
| 6. | Stresses in frames | 10 | CO5 |
| | **TOTAL** | 75 | |

***COURSE OBJECTIVES:***

| *Upon completion of the course, the student shall be able to* | | |
|---|---|---|
| **Course Objectives** | (i) | Understand the concepts of bending stresses, shear stresses and deflection induced in beams. |
| | (ii) | Understand the effect of loading on columns and their behaviour under loading, stability of Dams and Retaining walls under the action of lateral loads , effects of Loading on statically determinate beams and frames. |

***COURSE OUTCOMES:***

| | | | |
|---|---|---|---|
| **Course Outcomes** | CO1 | C-302.1 | Solve the problems pertaining to Bending equation and Shear stress distribution across the depth of various cross sections. |
| | CO2 | C-302.2 | Compute the Slope & Deflection in beams using double integration, Macaulay's & Mohr's Moment-Area methods. |
| | CO3 | C-302.3 | Compute 1. The load carrying capacity of columns and 2. Intensity of base pressure acting on dams and retaining walls. |
| | CO4 | C-302.4 | Explain the effects of Loading on propped cantilevers, fixed and continuous beams and sketch Shear force and Bending Moment diagram. |
| | CO5 | C-302.5 | Calculate the forces in trusses using method of joints and sections. |

***LEARNING OUTCOMES:***

| | |
|---|---|
| **Learning Outcomes** | **1.0 Theory of Simple Bending**<br>1.1 Define simple / pure bending and explain the process of simple bending<br>1.2 Define<br>a) Neutral layer<br>b) Neutral axis<br>c) Radius of curvature<br>1.3 List the assumptions made in the theory of simple bending and derive the bending equation for simple bending<br>1.4 Define<br>a) Bending Stress<br>b) Moment of Resistance<br>1.5 Explain and Sketch bending stress distribution across the depth of the beam for any cross section.<br>1.6 Define Modulus of section and Flexural rigidity and derive the formula for section modulus of (solid and hollow sections)<br>a) Square Section<br>b) Rectangular Section<br>c) Circular Section<br>1.7 Solve problems on theory of simple bending for Symmetrical and Unsymmetrical sections to calculate<br>a) Moment of Resistance or<br>b) Load carried or<br>c) Dimensions of cross section. |

| | |
|---|---|
| | 1.8 State formula for calculation of Shear Stress in any layer of a cross section (Derivation of formulae not required) and Draw shear distribution across<br>a) Rectangular section<br>b) Solid circular section<br>c) I - section<br>d) T - section<br>1.9 Determine shear stress at any layer and draw shear stress distribution diagram across<br>a) Rectangular section<br>b) I – section<br>1.10 Determine the maximum shear stress in circular, rectangular and square sections (Derivation of formulae not required)<br>2.0 **Deflection of Beams**<br>2.1 Draw the deflected shapes of different types of beams (like simply supported, cantilever, fixed and overhanging beams) and Define -Elastic curve, slope and Deflection<br>2.2 Distinguish between strength and stiffness of a beam.<br>2.2 Derive relation between slope, deflection and radius of curvature<br>2.3 Derive the equations for maximum slope and deflection by double integration method for:<br><br>a) Cantilever beams with point loads and uniformly distributed loads<br>b) Simply supported beams with central point load or uniformly distributed load throughout.<br>2.4 Calculate the maximum slope and deflection in simply supported and cantilever beams using the above formulae<br>2.5 Explain Mecaulay's method (for Simply supported beams) to find the slope and deflections<br>2.6 Compute the maximum slope and deflection for Simply Supported beam carrying point loads and uniformly distributed loads by Mecaulay's method<br>2.7 Explain the moment area method for slope and deflection and Define Mohr's theorem-I and Mohr's theorem-II<br>2.8 Derive formulae for maximum slope and deflection of standard cases by moment area method.<br>2.9 Compute the maximum slope and deflections for Cantilever andSimply Supported Beams by Mohr's theorem-I and Mohr's theorem-II (moment area method)<br>**3.0 Columns and Struts**<br>3.1 Define: i) Compression member ii) Axial Loading iii) List different types of compression members iv) Define:<br>a) Buckling/Critical/Crippling Loadb) Actual length<br>c) Least radius of gyration d) Safe loade) Factor of safety |

| | |
|---|---|
| | 3.2 Calculate least radius of gyration for solid/hollow circular, square and rectangular sections.<br>3.3 List different end conditions used for a column,<br>3.4 Define i) Effective/equivalent length<br>ii) Slenderness ratio<br>3.5 List the effective lengths of columns for different end conditions, Calculate the slenderness ratio for a given column/strut and Classify columns based on slenderness ratio or length and lateral dimensions, Distinguish between Long and short columns.<br>3.6 State Euler's formula for crippling load of a column/strut (derivation not required) and derive an expression showing limitations of Euler's formula, solve problems on limitations of Euler's formula, Calculate crippling and safe loads on a column/strut with simple/built up section using Euler's formula.<br>3.7 Explain the validity of Rankine's formula for short and long columns using basic Rankine's empirical formula, Obtain Rankine's formula for crippling load of a column/strut from basic empirical formula, calculate crippling or safe loads on a column/strut with simple/built up section using Rankine's formula.<br>3.8 Calculate the ratio of strengths of hollow and solid circular columns loaded under same conditions, Design a hollow circular cross section of a column for the given data.<br>3.9 Obtain the expression for pressure distribution at the base of a column, subjected to eccentric load about one axis only and compute the pressure distribution at the base of a column, subjected to an eccentric load about one axis only<br>3.10Define the core of a column, calculate core for circular/square/Rectangular columns and draw the shapes of core.<br>**4 Dams and Retaining Walls**<br>4.1 Define a dam/retaining wall; List the forces acting on a dam/retaining wall.<br>4.2 Derive the formula for maximum and minimum stress intensities at the base of a Trapezoidal dam with vertical water face and sketch the stress distribution at the base of a dam/retaining wall for different conditions, Calculate the stress intensity at base of a rectangular/Trapezoidal dam with or without free board.<br>4.3 List the conditions for stability of a dam/retaining wall, define middle third rule, define minimum base width of a dam/retaining wall, Derive the formula for minimum base width of a dam with and without free board to avoid tension at the base for the following sections 1. Trapezoidal section 2. Rectangular section 3. Triangular section and calculate the minimum base width based on above formulae |

| | |
|---|---|
| | 4.4 Explain the procedure to find the stresses at the base of a dam with battered water face and calculate the stresses at the base of a dam with battered water face, Solve the problems on checking the stability of a dam with vertical / inclined water face<br>4.5 Define: i) Angle of repose of soil<br>ii) Angle of Surcharge<br>iii) Active earth pressure<br>iv) Passive earth pressure<br>4.6 Compute the lateral earth pressure on a retaining wall having soil face vertical with levelled earth, surcharged earth and with levelled earth and UDL.<br>4.7 Calculate the stresses at the base of a retaining wall for the above cases, the minimum base width of a retaining wall with vertical soil face and levelled earth to avoid tension and sliding at base, the stresses at the base of a retaining wall with levelled earth and soil face inclined.<br>4.8 Check the stability of a retaining wall with soil face vertical and having levelled/surcharged earth or with soil face inclined and having levelled earth.<br>4.9 State Rankine's formula for minimum depth of foundation.<br>4.10 Calculate minimum depth of foundation for walls and columns using Rankine's formula.<br>**5 Statically Indeterminate Beams**<br>5.1 Differentiate between a statically determinate and indeterminate structure, define degree of static indeterminacy and Calculate degree of static indeterminacy for Propped cantilever, Fixed beam and Two span continuous beam<br>5.2 Calculate prop reaction of propped cantilever subjected to UDL throughout OR a single point load between fixed and propped ends and Calculate SF and BM values and draw SFD and BMD for a propped cantilever with above type of loading only, Calculate the location of point of contra flexure in propped cantilever for above loading.<br>5.3 State the merits and demerits of fixed beams and derive the conditions required for the analysis of fixed beams by moment area method.<br>5.4 Derive the formulae for the fixed end moments due to central point load or UDL throughout on a fixed beam and Draw SFD and BMD for a fixed beam with above type of loading only.<br>5.5 State the formulae for maximum deflection in a fixed beam due to above loading and calculate the maximum deflection in a fixed beam using above formulae.<br>5.6 State the merits and demerits of continuous beams and state the equation based on theorem of three moments. |

| | |
|---|---|
| | 5.7 Calculate support moments and span moments for a two-span continuous beam with simply supported or over hanging ends only, subjected to central point load or UDL throughout on each span, using theorem of three moments.<br>5.8 Calculate the support reactions for above type of continuous beams and Draw SFD and BMD for two span continuous beams, using theorem of three moments.<br>**6 Stresses in Frames**<br>6.1 Define a frame.<br>6.2 Classify the fames based on a) Number of members and b) Number of joints.<br>6.3 Show the sign convention for different types of stresses in members of a truss/frame.<br>6.4 Explain the rules for assuming the direction of stresses in the members.<br>6.5 Explain the method of calculating stresses/forces in the members of a truss/frame by the method of joints.<br>6.6 Calculate the forces in the members of a simply supported or cantilever truss/frame subjected to DL & LL at nodal points by the method of joints and prepare force table.<br>6.7 Differentiate method of joints and method of sections.<br>6.8 Calculate the forces in the members of a simply supported or cantilever truss / frame subjected to DL & LL at nodal points by the method of sections and prepare force table. |

***PO-CO Mapping:***

| **Course Code:** **C-302** | **Course Title:** **Mechanics of solids and Theory of Structures** **No of COs : 5** | | | | **No. of Periods: 75** |
|---|---|---|---|---|---|
| **POs** | **Mapped with CO No** | **CO periods addressing PO in Col 1** | | **Level (1,2,3)** | **Remarks** |
| | | **Nos.** | **%** | | |
| PO1 | CO1, CO2, CO3, CO4, CO5 | 39 | 52 | 3 | >40% Level.3 (Highly addressed) 25% - 40% Level.2 (Moderately addressed) 5% - 25% Level.1 (Low addressed) <5% Not addressed |
| PO2 | CO1, CO2, CO3, CO4,CO5 | 36 | 48 | 3 | |
| PO3 | | | | | |
| PO4 | | | | | |
| PO5 | | | | | |
| PO6 | | | | | |
| PO7 | | | | | |

***CO-PO Mapping:***

| **CO No.** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PSO1** | **PSO2** | **PSO3** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 3 | | | | | | 2 | 3 | 1 |
| **CO2** | 2 | 2 | | | | | | 2 | 3 | 1 |
| **CO3** | 2 | 2 | | | | | | 2 | 3 | 1 |
| **CO4** | 3 | 2 | | | | | | 2 | 3 | 1 |
| **CO5** | 3 | 2 | | | | | | 2 | 3 | 1 |
| **Average** | **2.4** | **2.2** | | | | | | 2 | 3 | 1 |

**Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**

**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc**

***COURSE CONTENT:***

**1.0 Theory of simple bending.**

Theory of simple bending – assumptions – Neutral axis – Bending stress distribution – Moment of resistance – curvature of beams – Bending equation – strength of beams – Rectangular, circular, and L sections practical applications – simple problems- Shear stress in beams – Equation for shear stress in a layer of a beam (Derivation of formula not required) – Shear Stress distribution diagrams for various beam sections such as rectangular, solid circular and I sections – Problems.

**2.0 Deflection of Beams**

Deflected shapes of beams with different support conditions – Strength and stiffness of beams – Relation between curvature, slope and deflection - Double integration method – Derivation of standard cases – Problems - Macaulay's method for slope and deflection – Simply supported beam under concentrated and uniformly distributed loads – Problems -d) Mohr's theorems for slope and deflection – Cantilevers and simply supported beams with symmetrical loading – Problems.

**3.0 Columns and struts**

Short and long columns – Axial loading only – solid circular, Hollow circular, Rectangle and I-section and Built up columns – different end conditions – slenderness ratio – calculation of safe load on columns by Euler's and Rankine's formula – Effective length, radius of gyration and slenderness ratio - limitation of Euler's formula – strength of columns – problems – stress distribution at the base of column due to eccentric load about one axis-problems – core of a column.

**4.0 Dams and retaining walls**

Introduction – rectangular dams – trapezoidal dams having water face vertical and inclined – Conditions for the stability of a dam – conditions to avoid tension in the masonry dam at its base, to prevent the over – turning of the dam, the sliding of dam and to prevent the crushing of masonry at the base of the dam – Minimum base width of a dam - Active and passive earth pressure – Angle of internal friction – Angle of surcharge – calculation of active earth pressure by Rankine's formula with and without surcharge - General conditions of stability of retaining walls – middle third rule – Distribution of pressure on foundation of retaining walls – calculation of minimum base width - Calculation of minimum depth of foundation by Rankine's formula.

**5.0 Statically indeterminate beams**

Statically determinate and indeterminate structures – definition – degree of static indeterminacy - Cantilever beam with UDL on whole span and propped at free end – cantilever beams with point load between fixed and propped ends – Calculation of prop reaction – SFD and BMD -Fixed Beams: Introduction-Sagging and hogging Bending moments – merits and demerits – Determination of Fixed end moments by moment Area method – standard cases – fixed beams subjected to symmetrical concentrated loads – Fixed beams subjected to U.D.L

throughout – sketching B.M.D. and S.F.D – problems (without sinking of props) – Max deflection formulae of fixed beams subjected to central point load and U.D.L throughout (No derivation) – problems -Continuous Beams: Merits and demerits – Continuous beams – effect of continuous supports – support moments – Clapeyron's Theorem of three moments – equation (without derivation) – continuous beams with central point load or U.D.L. throughout for each span – problems on two span continuous beams with simply supported or over hanging ends only – Reaction at supports in continuous beams – sketching S.F.D. and B.M.D (Beam with varying moments of inertia, supports at different levels not included)

**6.0 Stresses in frames**

Frames – Definition – classification based on number of members and number of joints – Determination of forces in members of statically determinate pin jointed frames – method of sections and method of joints – Application to simple frames and trusses (simply supported and cantilever) under loads at joints.

**REFERENCE BOOKS:**


1) Strength of Materials, R.K. Rajput, S.Chand Publishers, New Delhi
2) Strength of Materials, S. Ramamurtham, Dhanpat Rai Publishers, New Delhi
3) Strength of Materials, B.C.Punmia, Lakshmi Publications, New Delhi
4) Strength of Materials, R.S. Khurmi, S.Chand Publishers, New Delhi
5) Strength of Materials, R.K. Bansal, Lakshmi Publications, New Delhi

***MODEL BLUE PRINT:***

| S. No. | Major Topics | No. of periods | Weightage of marks | Marks wise Distribution of Weightage | | | | Question wise Distribution of Weightage | | | | COs Mapped |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | R | U | Ap | An | R | U | Ap | An | |
| 1. | Theory of simple bending | 15 | 14 | 3 | 3 | 8 | -- | 1 | 1 | 1 | -- | CO1 |
| 2. | Deflection of beams | 15 | 14 | 3 | 3 | 8 | -- | 1 | 1 | 1 | -- | CO2 |
| 3. | Columns and Struts | 10 | 11 | 3 | -- | 8 | -- | 1 | -- | 1 | -- | CO3 |
| 4. | Dams and Retaining walls | 15 | 14 | 3 | 3 | 8 | -- | 1 | 1 | 1 | -- | CO3 |
| 5. | Statically indeterminate beams | 10 | 17 | 3 | 3 | 8 | -- | 1 | 1 | 1 | -- | CO4 |
| 6. | Stresses in frames | 10 | | 3 | -- | | -- | 1 | -- | | -- | CO5 |
| Higher order question from any or combination of 3,4,5 chapters | | | 10 | -- | -- | -- | 10 | -- | -- | -- | 1 | CO3, CO4 |
| **TOTAL** | | | 80 | 18 | 12 | 40 | 10 | 6 | 4 | 5 | 1 | |

**R-Remember , U-Understand, Ap-Apply, An-Analyse**

**Table specifying the scope of syllabus to be covered for Unit Test-I & Unit Test-II**

| Unit Test | Learning Outcomes to be covered |
|---|---|
| Unit Test – I | From 1.1 to 3.9 |
| Unit Test – II | From 4.1 to 6.9 |

**Model Paper for Unit Test-I**

**State Board of Technical Education and Training, A.P.**

**Diploma in Civil Engineering (DCE)**

**Third Semester:C-302 MECHANICS OF SOLIDS & THEORY OF STRUCTURES**

**Time: 90 Minutes** **Unit Test –I** **Maximum Marks : 40**

**PART- A** **16 Marks**

***Instructions:*** **(i)** ***Answer all questions***

***(ii) First question carries FOUR marks, each question of remaining carries THREE marks.***

1. (a) A triangular beam of depth 300 mm is subjected to a max comp stress of 40N/mm$^2$ at the top. The tensile stress at the bottom of the beam is _____ (CO1)

   (b) The formula for section modulus of rectangular beam of dimensions bxd is___(CO1)

   (c) The maximum deflection of a cantilever beam of length 'L' subjected to u.d.l w kN/m acting throughout the length of the beam is _____ (CO2)

   (d) The ratio between effective length of the column to its least radius of gyration is called as_____ (CO3)

2. Find the moment of resistance of rectangular beam of breadth 240mm depth 400mm.If the bending stress is not to exceed 12 N/mm$^{2.}$ (CO1)

3. Draw the shear stress distribution for a rectangular cross section. (CO1)

4. A cantilever beam of span 3m carries a point load of 10kN at free end. Find the slope and deflection at the free end using Moment area method. Take E = 210 kN/mm$^2$ and I = 42 X 10$^6$ mm$^4$. (CO2)

5. Define (i) Critical load (ii) Safe load (iii) Slenderness ratio (CO3)

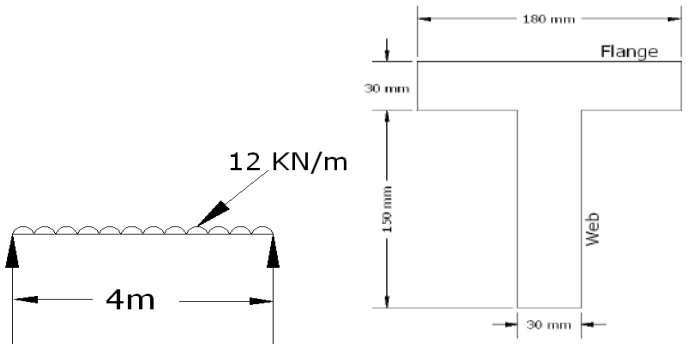
**PART- B** **3 x 8 = 24 Marks**

***Instructions :*** **(i)Answer all questions**

**(ii)Each question carries EIGHT marks**

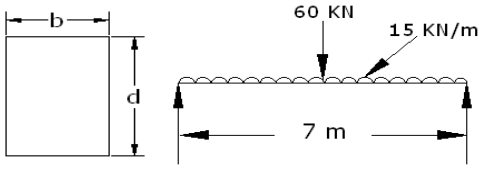
**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A) A T-Section shown in fig. is used as a beam over a span of 4m. Calculate the bending stress in the beam if it carries a UDL of 12 kN/m. (CO1)



(OR)

(B) A simply supported beam having a span of 8m carries a uniformly distributed loadof 18kN/m over its entire span and a point load of 60kN at its centre. Design a suitable rectangular beam if b/d ratio is 0.45, the bending stress is not to exceed 18N/mm$^2$. (CO1)




7. (A) A beam 6m long is Simply supported at its ends and carries a load of 20kN at a distance of 1m from each end. Calculate the values of Maximum slope and Maximum deflection occurring in the beam using Moment area method. Take EI = 42000 kNm$^2$. (CO2)

(OR)

(B) A beam of length 5m is fixed at one end and free at the other end, subjected to uniformly distributed load of 2 kN/m over a length of 3 m from the fixed end. Determine the maximum deflection at the free end. Take EI=1X10$^{13}$ Nmm$^2$. (CO2)

8. (A) An I-Section Joist of top & bottom flanges 200x20mm and web 20x360mm is 6m long, used as a column with both ends fixed. Calculate Euler's crippling load for the column? Assume E = 2x 10$^5$ N/mm$^2$. (CO3)

(OR)

(B) A hollow cast iron column of external diameter 200mm, thickness of 20mm and 4.5m long, fixed at both ends. Calculate the safe load by Rankine's formula using a factor of safety 4. Also determine ratio of Euler and Rankine's critical load. Given E = 100 kN/mm$^2$, $f_c$ = 550N/mm$^2$, a = 1/1600. (CO3)

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**Model Paper for Unit Test-II:**

**State Board of Technical Education and Training, A.P.**

**Diploma in Civil Engineering (DCE)**

**Third Semester:C-302 MECHANICS OF SOLIDS & THEORY OF STRUCTURES**

**Time: 90 Minutes** **Unit Test –II** **Maximum Marks: 40**

**PART- A** **16 Marks**

**Instructions :**

**(i) Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1. (a) For no tension to occur at the base of the dam, the resultant force acting in the dam c/s should pass within the middle third points (TRUE/FALSE) (CO3)

   (b) If angle of repose of soil mass is $30^{o}$, the ratio between Co-efficient of passive earth pressure to Co-efficient of active earth pressure is_____ (CO3)

   (c) Degree of statical indeterminacy of propped cantilever is _____ (CO4)

   (d) The frame is said to be perfect, when it satisfies the condition: n=2j-3 (TRUE/FALSE) (CO5)

2. Draw the stress distribution diagrams at the base of dam for three possible cases. (CO3)

3. Define (i) Critical load (ii) Safe load (iii) Slenderness ratio (CO3)

4. A propped cantilever beam of span 3.5m subjected to u.d.l of 20 kN/m acting throughout the length of the beam. If prop is provided at free end, find the prop reaction. (CO4)

5. What are the assumptions made in the analysis of truss. (CO5)

**PART- B** **3 x 8 = 24 Marks**

***Instructions :*** **(i) Answer all questions**

**(ii) Each question carries EIGHT marks**

**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A) A trapezoidal concrete dam has its water face vertical with 2.5m top width, stores water to a depth of 14 m with a free board of 2.0m. Take density of concrete as 24 $kN/m^3$. Calculate the minimum base width required. (CO3)

(OR)

(B) A masonry dam 8m high, 1.5m at top and 5m wide at bottom retains water to a depth of 7.5m, water face of dam is vertical. Find maximum and minimum stresses at base. Weight of masonry 22.4$kN/m^3$ and specific weight of water 10$kN/m^3$. (CO3)

7. (A) Calculate the stresses at the base of a masonry retaining wall of trapezoidal section given top width 1.0m, bottom width 3.0m, height 8m and the earth face vertical.It is retaining earth level with its top. $\emptyset = 45^0$, $\gamma = 18\ kN/m^3$, unit weight of masonry $\rho = 24\ kN/m3$. (CO3)

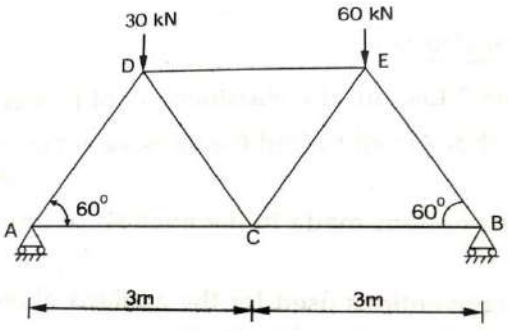
(OR)

(B) A propped cantilever beam of span 3.0m subjected to two-point loads 25 kN and 30 kN at 1m and 2m respectively from fixed end. If prop is provided at the free end, find the prop reaction and also plot SFD and BMD. (CO4)

8. (A) Plot SFD and BMD of a fixed beam of span 4m subjected to u.d.l of 20 kN/m acting throughout length of the beam. (CO4)

(OR)

(B) Determine the forces in the frame shown below by method of joints. (CO5)

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**Model Paper for End Examination:**

**MODEL PAPER - DIPLOMA EXAMINATION, (C–20)**

**DCE—THIRD SEMESTER EXAMINATION**

**MECHANICS OF SOLIDS AND THEORY OF STRUCTURES (C-302)**

*Time* : 3 hours ] [ *Total Marks* : 80

**PART—A** 3×10=30marks

***Instructions*** **: (1) Answer all questions.**

**(2) Each question carries three marks.**

**(3) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.**

1. State any three assumptions made in the theory of simple bending. (CO1)
2. Define (i) Neutral Axis (ii) Flexural rigidity. (CO1)
3. Distinguish between strength and stiffness of a beam. (CO2)
4. State Mohr's theorem and its limitations. (CO2)
5. Write any two differences between long columns and short columns. (CO3)
6. State the stability conditions for the Dams. (CO3)
7. Define the following terms:
   *(a)* Active earth pressure*(b)* Passive earth pressure. (CO3)
8. What is meant by degree of static indeterminacy? (CO4)
9. State the advantages of continuous beams. (CO4)
10. Name three different methods used to find the stresses in the members of a frame. (CO5)

**PART – B** **5x8 = 40marks**

**Answer either (a) or (b) from each question from Part-B**

11. A) Calculate maximum shear force and bending moment for a cantilever beam of span 3 m and carries an u.d.l. of 2 kN/m over a length of 1 m from free end and a point load of 10 kN is acting at a distance of 1 m from fixed end. (CO1)

**(OR)**

B) A beam of I—section, 150 mm deep and 80 mm wide has flanges 6·8 mm thick and web 4·8 mm thick is Simply Supported and carries a u.d.l of 20 kN/m over its entire span. Find the maximum permissible span without exceeding the shear stress of 60 N/mm2. Take *I xx* = 688.20 x$10^4$ $mm^4$ and A = 1808 $mm^2$. (CO1)

12. A) A Simply supported beam of span 5m carries a point load of 50kN acting at 3m from Left hand support. Find the maximum deflection using Macaulay's method. Assume EI = 4500 kN-$m^2$. (CO2)

**(OR)**

B) Two concentrated loads of 60 kN and 100 kN are placed on a simply supported beam of span 6 m at distances of 2 m and 3 m respectively from the left end. Determine the deflections under the two point loads, taking *EI* = 3000 kN/$m^2$. (CO2)

13. A**)** A stanchion is made up of an ISLB 300 mm×150 mm with two plates 150 mm×12 mm, one at top and one at bottom flanges. If it is used as a column 4m long with both ends hinged, find the safe load using Euler's formula, with a factor of safety of 3. For the given ISLB, *I*xx=73.329×106mm4, $I_{yy}$ =3.762×106mm4, area=4808mm2. Take *E*=210kN/mm2. (CO3)

**(OR)**

B) A hollow cylindrical cast iron column is 4 m long both ends being fixed. Design the column to carry and axial load of 250 kN. Use Rankine's formula and adopt factor of safety of 4. The internal diameter may be taken as 0.8 times the external dia. Take fC=550N/mm2 and a=1/1600. (CO3)

14. A**)** A trapezoidal concrete dam 2 m wide at top and 16m high with its vertical face on water side. A free board of 2m is to be provided. Find base width for most economical section of the dam. Take specific weight of concrete=24kN/m3 and specific weight of water=10kN/m3. (CO3)

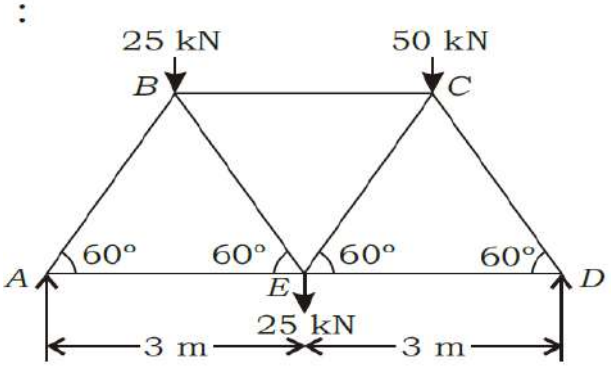
**(OR)**

**B)** A masonry retaining wall of trapezoidal section is 10m high and retains soil in level with the top. The width at the top is 3m and at the bottom is 6m and the retaining face is vertical. Find the maximum and minimum intensities of stresses at the base. Density of masonry is 24kN/$m_3$, unit weight of soil=10kN$m_3$, angle of repose of the soil=30°. (CO3)

15. A) Determine the fixed end moments and draw the shear force and bending moment diagrams. Also find the central deflection if the cross-section of the beam is a rectangle of size 300 mm X 400 mm and *E* = 160 GPa. (CO4)

**(OR)**

B) Find the magnitude and nature of forces in all members of the truss shown below: (CO5)




**PART – C** **1 X 10 = 10 marks**

**Question NO.16 is compulsory and carries 10 marks**

16. Determine the ratios of the buckling strengths of two circular columns, One hollow and the other solid. Both the columns are made of the same material and have the same length, same cross-sectional area and same end conditions. The internal dia. of the hollow column is half that of its external diameter. (CO3)

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# HYDRAULICS

| Course Code | Course Title | No. of Periods per Week | Total No. of Periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-303 | HYDRAULICS | 05 | 75 | 20 | 80 |

| S.No. | Major Topics | No. of Periods | COs Mapped |
|---|---|---|---|
| 1. | Properties of Fluids | 04 | CO1 |
| 2 | Fluid pressure and its measurements | 09 | CO1 |
| 3. | Flow of Fluids | 09 | CO2 |
| 4. | Flow through orifice and mouth pieces | 10 | CO3 |
| 5. | Flow over notches and weirs | 10 | CO3 |
| 6. | Flow through pipes | 10 | CO4 |
| 7. | Flow through open channels | 12 | CO4 |
| 8. | Pumps and Turbines | 08 | CO5 |
| 9. | Hydroelectric power plants | 03 | CO5 |
| | **Total** | 75 | |

**COURSE OBJECTIVES:**

| Upon completion of the course, the student shall be able to | | |
|---|---|---|
| **COURSE OBJECTIVES** | (i) | Understand the properties of liquids, water pressure and its measurement, principles of flow of water, flow through Orifice and Mouth Pieces, Flow over notches & weirs, flow through pipes, open channels. |
| | (ii) | Understand the working principles of pumps & turbines and general lay-out of Hydro-electric Power Plants. |

**COURSE OUTCOMES*:***

| | | | |
|---|---|---|---|
| **COURSE OUTCOMES** | CO1 | C-303.1 | Solve simple problems on properties of fluids and pressure measurements using various instruments. |
| | CO2 | C-303.2 | Solve the problems using the equation of continuity and energies of liquid in motion. |
| | CO3 | C-303.3 | Determine coefficient of discharge of a small orifice, mouth piece, Notches & Weirs and Venturimeter. |
| | CO4 | C-303.4 | Solve the problems of the major and minor losses of head of water flowing through pipes and channels using relevant formulae |
| | CO5 | C-303.5 | Justify the suitability of various Pumps and Turbines for the given conditions. |

LEARNING OUTCOMES:

| | |
|---|---|
| **LEARNING OUTCOMES** | **1.0 Properties of Fluids**<br>1.1 Explain the term fluid and give an example<br>1.2 Differentiate ideal and real fluids.<br>1.3 Distinguish between fluids & liquids.<br>1.4 Define the terms like - Mass density, Specific weight, Specific gravity, Adhesion, Cohesion, Surface tension, Capillarity, Compressibility, Viscosity and Vapour pressure.<br>1.5 State formulae of dynamic viscosity, capillarity, surface tension of water drop and soap bubble.<br>**2.0 Fluid pressure and its measurements**<br>2.1 Define the terms: Atmospheric pressure, Gauge pressure and Absolute pressure.<br>2.2 State the relation between the above three pressures.<br>2.3 Describe the following pressure measuring instruments: Piezometers, U-tube manometers, Differential manometers and Pressure gauges.<br>2.4 Compute the pressure of a flowing fluid given the readings on Piezometers, simple manometers, differential and inverted differential manometers.<br>2.5 Define Total Pressure and Centre of Pressure. State the formulae for total pressure and centre of pressure on the following surfaces immersed in a liquid at rest:<br>1. Horizontal plane,<br>2. Vertical plane and<br>3. Inclined plane<br>2.6 Calculate total pressure and centre of pressure for the above plane surfaces for the given conditions.<br>2.7 Determine total pressure and centre of pressure for hydraulic structure (like sluice gates, dams, lock gates).<br>**3.0 Flow of fluids**<br>3.1 State the different types of flow of liquids |

| | |
|---|---|
| | 3.2 Define :<br>i) Steady flow and Unsteady flow<br>ii) Uniform flow and Non-uniform flow,<br>iii) Laminar flow and Turbulent flow.<br>3.3 Distinguish between different types of flow of liquids.<br>3.4 Define discharge, State units of discharge<br>3.5 State one dimensional continuity equation.<br>3.6 Compute the discharge/velocity at a section of flowing liquid in pipe for the given conditions.<br>3.7 Explain the following energies of liquid in motion<br>1. Datum head,<br>2. Pressure head and<br>3. Velocity head.<br>3.8 State Bernoulli's theorem of total energy of a liquid in motion. List the limitations of Bernoulli's theorem. Compute the pressure/velocity at a section of flowing liquid in pipe for the given conditions using Bernoulli's equation. List three practical applications of Bernoulli's theorem.<br>3.9 Describe the working principle of<br>1. Venturimeter<br>2. Orifice meter and<br>3. Pitot tube.<br>3.10 State the formulae to calculate the actual discharge of flowing liquid through Venturimeter and Orifice meter. Compute the actual discharge of flowing liquid through Venturimeter and Orifice meter.<br><br>**4.0 Flow through Orifice and Mouth pieces**<br>4.1 Define orifice. List different types of orifices. Differentiate large orifice and small orifice.<br>4.2 Define the terms: Vena-contracta, Cc, Cv, Cd and Cr (Hydraulic coefficients). State the relation between above coefficients.<br>4.3 State the formula for theoretical discharge through small orifice<br>4.4 Calculate the discharge, Cc, Cv,Cd and Cr for given conditions-Numerical Problems<br>4.5 Derive formula for discharge through Large Rectangular Orifice. Calculate discharge through Large Rectangular Orifice for given conditions-Numerical Problems.<br>4.6 State the equations with standard notations for discharge through Fully submerged Orifice and Partially submerged Orifice. Compute the discharge for the above two orifices for the given conditions-Numerical problems.<br>4.7 State the formula for time of emptying of a prismatic tank by an orifice. Compute the time of emptying of a prismatic tank by an orifice.<br>4.8 Define mouth piece. Differentiate mouth piece and orifice. Classify mouth pieces.<br>4.9 State the formulae for discharge for different types of mouth pieces.<br><br>4.10 Calculate discharge through a mouth piece for given data-Numerical Problems. |

| | |
|---|---|
| | **5.0 Flow over notches and weirs**<br>5.1 Define a notch. List different types of notches.<br>5.2 State the formulae for the discharge through Rectangular Notch, Triangular notch and Trapezoidal notches. Calculate the discharge through the above notches from the given data.<br>5.3 Define weir. List different types of weirs. State the formulae for discharge over Sharp crested weir and Broad crested weirs.<br>5.4 State the formulae for discharge over above weirs with modifications for end contractions and velocity of approach.<br>5.5 Determine the discharge over sharp crested and broad crested weirs under given conditions – Numerical Problems.<br>5.6 Write the formulae to determine the discharge for rectangular weir - Francis, and 2. Bazin's empirical formula<br>5.7 Determine the discharge over rectangular weir using above two formulae for given data – Numerical Problems.<br>**6.0 Flow through Pipes**<br>6.1 List various losses that occur when water flow through pipes.<br>6.2 Differentiate Major loss and Minor losses.<br>6.3 State formulae to compute loss of head due to friction using Chezy, and Darcy.<br>6.4 Solve numerical problems in pipes based on the above two formulae for given data- Numerical problems.<br>6.5 State formulae for head loss due to various minor losses.<br>6.6 Compute the above minor losses of head for given data –Numerical problems.<br>6.7 Define the terms: Hydraulic gradient line and Total energy line.<br>6.8 Calculate the discharge through Parallel and Compound (series) Pipes connected to reservoir for given data- Numerical Problems.<br>6.9 Define the terms: Critical velocity and Reynold's number.<br>6.10 State whether the flow is laminar or turbulent based on Reynold's number.<br>**7.0 Flow through open channels**<br>7.1 Define open channel flow. Differentiate open channel flow and pipe flow.<br>7.2 Define the terms: Wetted perimeter and Hydraulic mean depth.<br>7.3 State Chezy's formula and Manning's formula for uniform flow through open channels.<br>7.4 List the Values of 'C' for different surfaces. State the following formulae to evaluate 'C'.<br>(i) Kutter's, formula<br>(ii) Manning's formula and<br>(iii) Bazin's formula<br>7.5 Calculate Velocity and Discharge in a channel using Chezy's and Manning's formulae for given conditions-Numerical problems.<br>7.6 Define most economical section of a channel.<br>7.7 List the conditions for most economical section of Rectangular channel and Trapezoidal channel.<br>7.8 Design rectangular channel sections for the given conditions.<br>7.9 Design trapezoidal channel sections for the given conditions. |

| | |
|---|---|
| | **8.0 Pumps and Turbines**<br>8.1 Define a Pump. List different types of Pumps. Describe the parts of Reciprocating Pump with a sketch.<br>8.2 Describe the working principle of Single acting and Double acting reciprocating pumps.<br>8.3 List the functions of air vessels in reciprocating pumps.<br>8.4 Describes the different parts of centrifugal pumps. Explain the working principle of centrifugal pump. Explain the necessity of priming. Explain the use of Foot valve and Strainer in a centrifugal pump.<br>8.5 List the pumps to be used for the condition of low head and maximum discharge and vice versa.<br>8.6 Distinguish Mono block from Centrifugal pump. State any three advantages of Submersible pumps<br>8.7 Describe: Jet pump, Air lift pump and Deep well pump. List the uses of Jet pump, Air lift pump and Deep well pump.<br>8.8 Define Turbine. List types of turbines. List the examples of Impulse Turbine and Reaction turbines. Differentiate between Impulse and Reaction turbines.<br>8.9 Explain the working principle of Pelton wheel turbine.<br>8.10 Describe the Parts of Francis Turbine. Explain the purpose of draft tube. List types of draft tubes.<br><br>**9.0 Hydro-Electric Power Plants**<br>9.1 Sketch a typical layout of hydro-electric power plant installation.<br>9.2 List different components of hydro-electric power plant installation.<br>9.3 Define a surge tank.<br>9.4 List the functions of surge tank. |

**PO-CO Mapping:**

| **Course Code: C-303** | **Course Title: HYDRAULICS**<br>**No of COs: 5** | | | | **No. of Periods: 75** |
|---|---|---|---|---|---|
| **POs** | **Mapped with CO Nos.** | **CO periods addressing PO in Col 1** | | **Level (1,2,3)** | **Remarks** |
| | | **No.** | **%** | | |
| PO1 | CO1, CO2, CO3, CO4, CO5 | 25 | 33 | 2 | >40% Level.3 (Highly addressed)<br><br>25% - 40% Level.2 (Moderately addressed)<br><br>5% - 25% Level.1 (Low addressed)<br><br><5% Not addressed |
| PO2 | CO1, CO2, CO3, CO4, CO5 | 50 | 67 | 3 | |
| PO3 | | | | | |
| PO4 | | | | | |
| PO5 | | | | | |
| PO6 | | | | | |
| PO7 | | | | | |

**CO-PO Mapping:**

| CO No. | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | | | | | | 3 | 3 | 3 |
| **CO2** | 2 | 3 | | | | | | 3 | 3 | 3 |
| **CO3** | 2 | 3 | | | | | | 3 | 3 | 3 |
| **CO4** | 3 | 2 | | | | | | 3 | 3 | 3 |
| **CO5** | 2 | 3 | | | | | | 3 | 3 | 3 |
| **Average** | 2.4 | 2.6 | | | | | | 3 | 3 | 3 |

**Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**

**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc**

## COURSE CONTENT:

**1. Properties of liquids**

Scope and importance of hydraulics in Civil Engineering - Fluids – classification - ideal and real fluids - Difference between fluids and liquids - Properties of liquids - Formulae for Dynamic viscosity, Kinematic viscosity, surface tension of water and soap bubble, capillarity.

**2. Liquid pressure and its measurement**

Atmospheric pressure, gauge pressure and absolute pressure and relationship - Pressure measuring Instruments – Piezometer- Manometers – U-tube, inverted U-tube and differential manometers – Description - Measurement of the Pressure of a flowing liquid – Piezometer - simple, differential and inverted differential manometers - Total pressure and Centre of pressure on plane surface immersed in liquid – Horizontal, Vertical and inclined plane surfaces and Practical Applications- Numerical Problems on Total pressure and Centre of pressure.

**3. Flow of liquids**

Types of Flow-Uniform flow, non-uniform flow, stream line flow, turbulent flow, steady flow and unsteady flow - Rate of flow or discharge-continuity equation – one dimensional – Principle - Numerical Problems - Energies of liquid in motion – datum head – pressure head and velocity head - Total energy of liquid in motion – Bernoulli's theorem (without proof) - limitations of Bernoulli's theorem - Numerical Problems - Practical applications of Bernoulli's theorem - venturi meter - orifice meter - pitot tube - Numerical Problems on venturi meter and orifice meter.

**4. Flow through Orifices and Mouth Pieces**

Orifice-types of Orifices-difference of small and large orifice-Determination of discharge through small Orifice - Vena Contracta-Hydraulic coefficients (Cv,Cc,Cd and Cr) – relation -(No derivation) - Numerical Problems - Large Rectangular Orifice- Derivation of formula for discharge- Numerical Problems - Flow through fully submerged and partially submerged orifices-explanation- formula for discharge- Numerical Problems - Time of emptying of a prismatic tank by an orifice- Numerical Problems - Mouth piece-Difference between Orifice and Mouth piece - Types of Mouth pieces – equations for discharge-determination of discharge through a Mouth piece from the given details.

**5. Flow over Notches and Weirs**

Notches - types of notches - rectangular, triangular and trapezoidal notches - Formulae for the discharge over rectangular, triangular and trapezoidal notches-Numerical problems (Derivation of formulae not required) – Weirs - types of weirs – sharp crested and broad crested weirs - Formulae for the discharge over a sharp crested and broad crested weirs -Numerical problems (Derivation of formulae not required) - Equations of discharge for the above weirs with velocity of approach and end contractions - Empirical formulae for discharge over rectangular weir-Francis formula-Bazins formula- Numerical problems (Derivation of formulae not required).

**6. Flow thorough pipes**

Major and minor losses - Frictional loss in pipes - Chezy's formula and Darcy's formula (without proof) - Numerical problems - Minor Losses - Loss of head at entrance and exit of pipe, loss of head due to sudden enlargement, sudden contraction – Formulae - simple problems - Hydraulic gradient and total energy line - Discharge through parallel pipes and compound pipes (series) connected to a reservoir - Laminar and turbulent flow in pipes - critical velocity and Reynold's number – significance (no problems).

**7. Flow through open Channels**

Open channel flow - differences between open channel flow and pipe flow - Geometric properties of channel - Wetted perimeter and hydraulic mean depth - Discharge through open channel –Chezy's formula (derivation not necessary) - Numerical problems - Value of 'C' for different surfaces - Empirical formulae for value of 'C' - Kutter's formula, Manning's formula, Bazin's formula - Conditions for Most economical section of a channel - rectangular and trapezoidal sections - Design of cross sections- problems.

**8. Pumps and Turbines**

Pumps - types - reciprocating pumps and centrifugal pumps - Reciprocating pumps- singe acting and double acting pumps- description and working – functions of air vessels - Centrifugal pumps - description of parts – working – priming - foot valve and strainer - Other type of pumps-jet, airlift, deep well pumps and submersible pumps – brief description – uses – Turbines - Classification of turbines-impulse and reaction turbines - Impulse turbine - Pelton Wheel, description and working(without problems) - Reaction turbines- Francis and Kaplan turbines - Description and working of Francis turbine (without problems) - Draft tube- purpose and types.

**9. Hydro-electric Installation**

Sketch a typical layout of a hydroelectric power plant - components – Intake works, Pressure tunnel, Penstock, surge tank, anchor blocks and tailrace - Functions of surge tank.

**REFERENCE BOOKS:**


1. Fluid Mechanics and Hydraulic Machines by R.K. Bansal, Laxmi Publications.
2. Hydraulics and Fluid Mechanics Including Hydraulics Machines by P. N. Modi & S.M. Seth, Rajsons publications,Pvt.Ltd.
3. Hydraulics, Fluid Mechanics & Hydraulic Machines,R.S Khurmi &N.Khurmi, S.Chand Publications.
4. Fluid Mechanics,Frank white, SIE


**MODEL BLUE PRINT**

| S. No. | Major Topics | No. of periods | Weightage of marks | Marks wise Distribution of Weightage | | | | Question wise Distribution of Weightage | | | | COs Mapped |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | R | U | Ap | An | R | U | Ap | An | |
| 1 | Properties of Fluids | 04 | 03 | 3 | -- | -- | -- | 1 | -- | -- | -- | CO1 |
| 2 | Fluid pressure and its measurements | 09 | 14 | 3 | -- | 8 | -- | 1 | -- | 1 | -- | CO1 |
| 3 | Flow of Fluids | 09 | | 3 | -- | | -- | 1 | -- | | -- | CO2 |
| 4 | Flow through orifice and mouth pieces | 10 | 11 | 3 | -- | 8 | -- | 1 | -- | 1 | -- | CO3 |
| 5 | Flow over notches and weirs | 10 | 14 | 3 | 3 | 8 | -- | 1 | 1 | 1 | -- | CO3 |
| 6 | Flow through pipes | 10 | 11 | 3 | -- | 8 | -- | 1 | -- | 1 | -- | CO4 |
| 7 | Flow through open channels | 12 | 11 | 3 | -- | 8 | -- | 1 | -- | 1 | -- | CO4 |
| 8 | Pumps& Turbines | 08 | 03 | 3 | -- | -- | -- | 1 | -- | -- | -- | CO5 |
| 9 | Hydroelectric power plants | 03 | 03 | 3 | -- | -- | -- | 1 | -- | -- | -- | CO5 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Higher order question from any or combination of 1,2,3,6,7 Chapters** | 10 | -- | -- | -- | 10 | -- | -- | -- | 1 | CO1,CO2,CO4 |
| **TOTAL** | 80 | 27 | 3 | 40 | 10 | 9 | 1 | 5 | 1 | |

R-Remember U-Understanding Ap-Application An-Analysis

**Table specifying the scope of syllabus to be covered for Unit Test-I & Unit Test-II**

| **Unit Test** | **Learning Outcomes to be covered** |
|---|---|
| Unit Test – I | From 1.1 to 5.2 |
| Unit Test – II | From 5.3 to 9.4 |

**Model Paper for Unit Test-I :**
**State Board of Technical Education and Training, A.P.**
**Diploma in Civil Engineering (DCE)**
**Third Semester:C-303 HYDRAULICS**

Time: 90 Minutes **Unit Test –I** Maximum Marks : 40

**PART- A** **16 Marks**

***Instructions :***

**(i) Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1. (a) Specific gravity has the same unit as that of mass density – True/False (CO1)

   (b) Viscosity is the resistance to flow of fluids – True/False (CO1)

   (c) The unit for measuring discharge in SI system is ---------- (CO2)

   (d) The ratio of actual discharge of orifice to the theoretical discharge is called..... (CO3)

2. Define (a) Specific weight (b) Cohesion (c) Surface tension (CO1)

3. State the types of fluid pressure measuring devices (CO2)

4. State and briefly explain the equation of continuity (CO3)

5. Define a Notch and state the types based on its shape. (CO3)

**PART- B** **3 x 8 = 24 Marks**

***Instructions :***

**(i) Answer all questions**
**(ii) Each question carries EIGHT mark**
**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A) A rectangular plate 3 m long and 1.5 m wide is immersed vertically in water in such a way that its 3m side is parallel to water surface and its top edge is 2.5m below the free surface. Find the total pressure and depth of centre of pressure on one side of the plate? (CO1)

   (OR)

   (B) A circular plate 2.1M diameter is immersed in water so that its plane makes an angle of 300 to the water surface and higher point of the plate is 2.0M below the surface. Calculate the total pressure and centre of pressure. (CO1)

7. (A) A pipe 340 m long has a slope 1 in 100 and tapers from 1.25 m diameter at the higher end to 625mm diameter at the lower end. Determine the pressure at lower end. If the pressure at the higher end 0.14N/$mm^2$ and the discharge through the pipe is 108lit/sec of water. (CO2)

(OR)

(B) (i) write any three assumptions of Bernoulli's equation?(ii)A pipe of 0.3m diameter carries an oil of specific gravity 0.9 at the rate of 120 lit/sec. Pressure at a point A in the pipe is 24.5 kN/$m^2$. If the point A is 5m above the datum line calculate the total head in meters of oil.

(CO2)

8. (A) A circular tank of diameter 3m contains water up to a height of 9m. An orifice of diameter 400mm is provided at the bottom of the tank. Calculate time required for empty the tank,if $c_d$ =0.97. (CO3)

(OR)

(B) A Right-angle triangular V-Notch was used to measure discharge of a centrifugal pump. If the depth of water at V-Notch is 200mm, calculate the discharge over the notch in lit per minute. Cd=0.62. (CO3)

oOo

**Model Paper for Unit Test-II**
**State Board of Technical Education and Training, A.P.**
**Diploma in Civil Engineering (DCE)**
**Third Semester:C-303 HYDRAULICS**

**Time: 90 Minutes** **Unit Test –II** **Maximum Marks : 40**

**PART- A** **16 Marks**

**Instructions :**

**(i) Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1. (a) Weirs are used to find the discharge of rivers – True/False (CO3)

   (b) If the Reservoirs are kept at the same level the head loss is zero – True/False (CO4)

   (c) In open channel, If the flow characteristics unchanged with space the flow is called---(CO4)

   (d) Low specific speed of turbine implies it is a..... Turbine (CO4)

2. State (i) Darcy's equation (ii) Chezy's equation to find the Loss of head due to Friction(CO4)

3. Define the terms (a) Reynold's number (b) Hydraulic mean Depth (CO4)

4. Sketch a Centrifugal pump and show its parts. (CO5)

5. State any three components of a Hydro Electric Power Station. (CO5)

**PART- B** **3 x 8 = 24 Marks**

***Instructions :***

**(i) Answer all questions**

**(ii) Each question carries EIGHT mark**

**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A) Water is passing over a rectangular notch flows subsequently over a right-angled triangular notch. The length of the rectangular notch is 0.6 m and its coefficient of discharge is 0.62. If the coefficient for triangular notch is 0.59, what will be the head through the triangular notch when the head over rectangular notch is 0.15m? (CO3)

   (OR)

   (B)A broad crested weir is constructed across the entire 3 m width of a rectangular channel. If the head on the weir crest is 56 cm, find the discharge over the weir. Take $C_d$ = 0·96. (CO3)

7. (A) Two reservoirs are connected by a pipe line 22 m long consisting of two pipes one of 15 cm dia. and length 6m and the other of diameter 22.5 cm and 16 m length. If the difference of water levels in two reservoirs is 6 m, calculate the discharge considering all losses. Take f = 0.04. (CO4)

(OR)

(B) Two Reservoirs are connected by a straight pipe 1500 m long. For the first 800m length it has 200 mm diameter and then reduced to 150mm diameter for the remaining length. The water levels in the two reservoirs differ by 25m. Determine all the losses of head and also the Discharge in cumecs. Take friction f = 0.01. (CO4)

8. (A) A Trapezoidal channel section has side slopes 1 vertical to 2 horizontal. The discharge in the channel is 16 $m^3$/sec, with a bed slope of 1 in 2000. Design the channel for the most economic section. Use manning formula with N = 0.012 (CO4)

(OR)

(B) A trapezoidal channel has side slopes 1 : 1 and is discharging 20 $m^3$/sec with bed slope of 0·5 m per 1000 m. Manning's n = 0·01. Determine the section of the channel. (CO4)

***

**Model Paper for End Examination :**

**MODEL PAPER – BOARD DIPLOMA EXAMINATION, (C–20)**

**DCE—THIRDSEMESTER EXAMINATION**

**HYDRAULICS (C-303)**

**Time: 3 hours] [Total Marks: 80**

**PART—A** **3×10=30 Marks**

**Instructions: (1) Answer all questions.**

**(2) Each question carries three marks.**

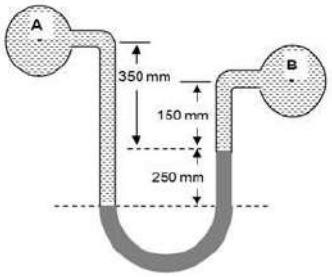
**(3) Answers should be brief and straight to the point and shall not exceed five simple sentences.**

1. Define the terms viscosity, capillarity and surface "tension". (CO1)
2. State the relation among atmospheric pressure, gauge pressure and absolute pressure. (CO1)
3. State the Bernoulli's theorem and express it in equation form (CO2)
4. State the classification of mouth pieces according to shape and according to position.(CO3)
5. Find the discharge over a rectangular notch having width 2m and a constant head of 30cm. assume $C_d$ = 0.62. (CO3)
6. List the classification of weirs. (CO3)
7. Define Reynold's number. How it is useful in determining the type of flow. (CO4)
8. What do you understand by the term most economical section of channel? (CO4)
9. List the functions of air vessels in reciprocating pumps. (CO5)
10. State the component parts of a hydroelectric power plant. (CO5)

**PART – B** **8 x 5 = 40 marks**

**Answer either (a) or (b) from each questions from Part-B**

11.A) U-tube differential manometer is used to find out a pressure difference of liquids in pipe A and pipe B as shown in figure. If the pipe A contains liquid of specific gravity 1·6 and pipe B contains water, find the difference of pressure between the two points. Manometric liquid is mercury of specific gravity 13.6. (CO1)




**(OR)**

B) The diameter of a pipe changes gradually from 150mm at point A to 100mm at point B, which are situated at 20m and 16mrespectively above the datum. Determine the pressure at B, if the pressure at A is 0.2 N/mm$^2$ and velocity of flow at A is 1.1m/sec. Neglect the losses between a and B. (CO2)

12. A) Calculate the discharge passing through an orifice 80 cm wide and 60 cm deep in the side of tank. It is having a water level of 3·5 m above the upper edge of the orifice and tail water is 20 cm above the lower edge of the orifice. Take Cd = 0·62. (CO3)

**(OR)**

B) (i) Define co-efficient of contraction and deduce the relation between the three hydraulic co-efficient.

(ii) an internal mouthpiece of diameter 60mm is discharged water under a constant head of 9m. Find the discharge in lit/sec, if the mouthpiece is (i) running free, (ii) running full.(CO3)

13. A) Water passing over a rectangular notch flows subsequently over a right-angled triangular notch. The length of the rectangular notch is 0·6 m and the coefficient of discharge is 0·62. If the coefficient of discharge of triangular notch is 0·59, what will be the head through the triangular notch when the head over rectangular notch is 0·15 m? (CO3)

**(OR)**

B) A broad crested weir with flat top is constructed across the entire 2·7 m width of a rectangular channel. If the head on the weir crest is 41·5 cm, find the discharge over the weir. Take Cd = 0·97 (CO3)

14. A) Water flows through a pipe 250 cm diameter 80 m long with a velocity of 3·5 m/sec find the loss of friction using (a) Darcy's formula and (b) Chezy's formula (CO4)

**(OR)**

B) A compound piping system consists of three pipes of lengths 1500 m, 1200 m and 1000 m and diameters 0·5 m, 0·4 m and 0·3 m respectively are connected in series. Convert the system to (a) an equivalent Length of 0·4 m diameter pipe; (b) an equivalent size of pipe 3700 m long (CO4)

15. A)Arectangular channel having most economical section is 6m wide. Find the discharge, if the bed slope is 1 in 1200. Assume 'C' as 50. (CO4)

**(OR)**

B) A trapezoidal channel has side slopes 1:1 and is discharging 20 $m^3$/sec with bed slope of 0·5 m per 1000 m. Mannings n = 0·01. Determine the section of the channel. (CO4)

**PART – C**

**Question No.16 is compulsory and carries 10 marks** **1 X 10 = 10 marks**

16. (i) State the Darcy's weishbach equation for head loss due to friction in pipes and name the terms.

(ii) A 2 km long water main has to carry a discharge of 0·5 cumec. If the maximum allowable loss of head due to friction is 26 m, find the minimum diameter required. Use Darcy's equation. Assume f = 0.008. Neglect the minor losses.

***

# SURVEYING-II

| Course Code | Course Title | No. of Periods per Week | Total No. of Periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-304 | SURVEYING-II | 04 | 60 | 20 | 80 |

**COURSE OBJECTIVES:**

| S.No. | Major Topics | No. of Periods | COs Mapped |
|---|---|---|---|
| 1 | Theodolite Survey | 16 | CO1 |
| 2. | Trigonometric levelling | 10 | CO2 |
| 3. | Tacheometry | 10 | CO3 |
| 4 | Curves | 16 | CO4 |
| 5 | Advanced surveying using GPS and GIS | 8 | CO5 |
| | **Total** | 60 | |

Upon completion of the course, the student shall be able to

| | | |
|---|---|---|
| **COURSE OBJECTIVES** | (i) | Develop skills in using Theodolites and Know about applications of principles of Trigonometric levelling and Tacheometry. |
| | (ii) | Understand the need for setting out the curves and methods of setting out simple curves |
| | (iii) | Understand the principles of advanced surveying systems viz., GPS, GIS and their applications |

**COURSE OUTCOMES:**

| | | | |
|---|---|---|---|
| **COURSE OUTCOMES** | CO1 | C-304.1 | Suggest with justification in the use of theodolite for Traversing |
| | CO2 | C-304.2 | Describe the principles of Trigonometrical Levelling and compute the distance and elevation for different conditions. |
| | CO3 | C-304.3 | Find the vertical and horizontal distances using stadia & tangential tacheometry. |
| | CO4 | C-304.4 | Calculate the data required for setting out simple circular curve |
| | CO5 | C-304.5 | Explain the concepts of GPS and GIS and their applications in Civil Engineering. |

**LEARNING OUTCOMES**:

| | |
|---|---|
| **LEARNING OUTCOMES** | **1.0 Theodolite survey**<br>1.1 List the uses and types of a Theodolite, differentiate between transit and non-transit theodolites, List the parts of a transit Theodolite, explain the functions of parts of a transit theodolite.<br>1.2 Define the terms Face left observation, Face right observation, Swing of telescope, Telescope normal and Telescope inverted, List thefundamental lines of a transit Theodolite, explain the relationship of fundamental lines of theodolite, Explain the steps involved in carrying out temporary adjustments of a transit theodolite for taking observations, Read the reading of vernier and least count<br>1.3 Explain the method of measuring the horizontal angle by repetition method, rule out the page of a theodolite field book, calculate the angle by the method of repetition, List the errors eliminated in repetition method<br>1.4 Explain the method of measuring of horizontal angle by reiteration method, Rule the page of a theodolite field book, explain the method of calculating angles by method of reiteration<br>1.5 Explain the method of measurement of Direct angles and Deflection angles, explain the Steps involved in setting out angles using a theodolite.<br>1.6 Explain the methods of measurement of vertical angles, magnetic bearing of a line, Explain the methods of prolonging a given survey line<br>1.7 Explain the method of conducting traverse survey by Included angles method, Deflection angles method and Magnetic bearing method,Check the angular measurements and apply corrections in a closed traverse<br>1.8 Define Latitude and Departure of a line, Compute the latitudes and departures of survey lines of a closed traverse, calculate the error of closure of a closed traverse, List the omitted measurements of a closed traverse and calculate the omitted measurements when Length and bearing of one side only is omitted, Balance the closing error by Bowditch rule and Transit rule.<br>1.9 Enumerate the difference between consecutive and independent co-ordinates, Calculate the consecutive and independent co-ordinates of stations of a closed traverse and calculate the area of a closed Traverse by independent co-ordinates<br>1.10 List the types of errors in theodolite surveying.<br>**2.0 Trigonometric Levelling**<br>2.1 Define trigonometrical levelling<br>2.2 Explain different cases that occur in trigonometrical levelling to find the elevation and distance of a given object (base of the object accessible or inaccessible) |

| | |
|---|---|
| | 2.3 Derive formula for finding height and elevation of an object when the base of the object is accessible.<br>2.4 Calculate the height and elevation of an object when the base of the object is accessible.<br>2.5 Derive the formula to find the distance and elevation of the object when the base of the object is inaccessible and instrument stations and object are in the same vertical plane<br>2.6 Calculate the distance and elevation of the object when the base of the object is inaccessible and instrument stations and object are in the same vertical plane<br>2.7 Describe the procedure to find the distance and elevation of the object when the base of the object is inaccessible and instrument stations and object are not in the same vertical plane.<br>2.8 Calculate the distance and elevation of the object when the base of the object is inaccessible and instrument stations and object are not in the same vertical plane.<br>**3.0 Tacheometry**<br>3.1 Define tacheometry and uses of tacheometry and explain the principles of stadia tacheometry, List the different methods of tacheometry, define staff intercept<br>3.2 List the constants of tacheometry in stadia tacheometry<br>3.3 Derive the formulae to determine the horizontal distance of staff station from the instrument station using stadia tacheometry, when the line of collimation is horizontal with staff held vertical<br>3.4 Derive the formulae to determine the elevation of the staff station using stadia tacheometry, when the line of collimation is horizontal with staff held vertical, Calculate the horizontal distance of staff station from the instrument station and its elevation when the line of collimation is horizontal with staff held vertical.<br>3.5 Explain the procedure for determining tacheometric constants, State the use of analytic lenses<br>3.6 Write the formulae to determine the horizontal distance of staff station from the instrument station using stadia tacheometry When the line of collimation is inclined with staff held vertical (without derivation), Write the formulae to determine the elevation of the staff station using stadia tacheometry When the line of collimation is inclined with staff held vertical (without derivation)<br>3.7 Calculate the horizontal distance of staff station from the instrument station and its elevation when the line of collimation is inclined with staff held vertical, Compute the horizontal distance and difference in elevations between any two staff stations (instrument station and staff stations are lying in the same vertical plane and when the instrument station and staff stations are not lying in the same vertical plane) using stadia tacheometry |

| | |
|---|---|
| | 3.8 Explain the principle of Tangential Tacheometry, enumerate the difference between Stadia and tangential tacheometry<br>3.9 Derive the formula to determine the distance of staff station from the instrument station and elevation of the staff station by tangential tacheometry<br>3.10 Compute the horizontal distance of staff station from instrument station and its elevation by tangential tacheometry, Compute the horizontal distance and difference in elevations between any two staff stations using tangential tacheometry (instrument station and staff stations are lying in the same vertical plane and the instrument station and staff stations are not lying in the same vertical plane).<br><br>**4.0 Curves**<br>4.1 List the types of horizontal curves<br>4.2 Define Simple curve<br>4.3 Define degree of curve and state the relation between the radius and degree of curve according to chord length / arc length and Calculate degree of curve using above relations<br>4.4 Sketch a simple circular curve and show its elements<br>4.5 Define various elements of a simple circular curve<br>4.6 Compute the length of curve, tangent length, length of long chord and mid ordinate, apex distance and chainages at salient points of a curve<br>4.7 List the linear and angular methods of curve setting<br>4.8 Explain the procedure for setting out a curve by linear methods<br>4.9 Explain the procedure for setting out a curve by angular methods<br>4.10 Calculate the data required for setting out a curve for above methods and prepare the curve tables.<br><br>**5.0 Advanced surveying using GPS and GIS**<br>5.1 List the modern surveying techniques<br>5.2 Define GPS and explain the working principle of GPS<br>5.3 Explain the segments of GPS and Enumerate the types of GPS receivers<br>5.4 Explain taking coordinates of various points using GPS<br>5.5 List the applications of GPS in civil Engineering<br>5.6 List merits and demerits of GPS<br>5.7 Define GIS and State the components of GIS<br>5.8 List and explain the types of data used in GIS<br>5.9 Define map and list the types of map projections<br>5.10 List the uses and applications of GIS in civil Engineering |

**PO-CO Mapping:**

| Course Code: C- 304 | Course Title: SURVEYING-II<br>No. of COs: 5 | | | | No. of Periods: 60 |
|---|---|---|---|---|---|
| POs | Mapped with CO Nos. | CO periods addressing PO in Col.1 | | Level (1,2,3) | Remarks |
| | | No. | % | | |
| 1 | CO1, CO2, CO3, CO4, CO5 | 24 | 40 | 3 | >40% Level.3 (Highly addressed) |
| 2 | CO1, CO2, CO3, CO4, CO5 | 15 | 25 | 2 | |
| 3 | | | | | 25% - 40% Level.2 (Moderately addressed) |
| 4 | CO1, CO2, CO3, CO4, CO5 | 15 | 25 | 2 | |
| 5 | CO2, CO4, CO5 | 6 | 10 | 1 | 5% - 25% Level.1 (Low addressed) |
| 6 | | | | | |
| 7 | | | | | <5% Not addressed |

**CO-PO Mapping:**

| CO No. | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | | 2 | | | | 1 | 2 | 2 |
| CO2 | 2 | 2 | | 3 | 2 | | | 1 | 2 | 2 |
| CO3 | 3 | 2 | | 3 | | | | 1 | 2 | 2 |
| CO4 | 3 | 3 | | 3 | 2 | | | 1 | 2 | 2 |
| CO5 | 3 | 3 | | 2 | 2 | | | 1 | 2 | 2 |
| Average | 2.6 | 2.4 | | 2.6 | 2 | | | 1 | 2 | 2 |

**Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**

**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc**

## COURSE CONTENT:

**1.0 Theodolite Surveying**

Component parts of a transit theodolite and their functions – Definitions of technical Terms – Station, face left, face right, swinging the telescope, transiting - Fundamental lines of a transit theodolite – Horizontal axis, vertical axis, axis of telescope, axis of plate levels, axis of altitude bubble, line of collimation – Conditions of adjustments - Temporary adjustments of a transit theodolite - Measurement of horizontal angles by repetition and reiteration method - Measurement of vertical angles - Booking readings - Measurement of magnetic bearings, deflection angles, direct angles – Prolonging a straight line – by single transiting, double transiting and fore sighting methods -Errors in theodolite work - Theodolite Traversing -

Traversing with theodolite by included angles method, deflection angles method and magnetic bearing method - Checks for closed and open traverse - Traverse computations – Latitude and departure – closing error – balancing a closed traverse by Bowditch rule and transit rule – omitted measurements in a closed traverse – problems on omitted measurements (Length and bearing of one side only omitted) – consecutive and independent coordinates - area of closed traverse.

**2.0 Trigonometric levelling**

Principle and necessity of Trigonometric levelling - Elevations and distances of objects whose base is accessible or inaccessible, with instruments stations and object in the same vertical plane or in different vertical planes.

**3.0 Tacheometry**

Tacheometry – principle – uses – types – stadia and tangential tacheometry -Stadia Tacheometry with staff held vertical and line of collimation horizontal or inclined – elevations and distances of staff stations – determination of Tacheometric constants - Tachometric tables – problems - Tangential Tachometry – uses – Finding elevation and distances – Problems.

**4.0 Curves**

Curves – types of horizontal curves – simple, compound and reverse curves – degree of curve – formulae for degree of curve using 20m / 30m chain – elements of simple circular curve – Point of commencement of curve, point of tangency, forward and back tangents, point of intersection, angle of intersection, deflection angle, length of curve, tangent length, long chord, mid ordinate, normal chord and sub chord -Calculation of elements of simple circular curve - Method of curve setting – chain and tape methods – offsets from long chord method, successive bisection of arcs method, off sets from tangent (radial and Perpendicular offsets) method and off sets from chords produced method – angular methods – single and double theodolite methods -Preparation of curve table for curve setting – problems.

**5.0 Advanced surveying using GPS and GIS**

Global Positioning system (GPS) – principles – segments – space control and user segments – receivers – observation and data processing – applications in Civil Engineering – advantages and disadvantages of GPS – Geographical information systems (GIS) – definition – components – Map – Map projections – types of data used – use and application in civil engineering.

**REFERENCE BOOKS:**


1) Surveying Vol.I&Vol.II by B.C Punmia, Ashok Jain & Arun Jain, Laxmi publications
2) Surveying Vol.I&Vol.II by Dr.K.R. Arora, Rajsons Publications Pvt.Ltd
3) Surveying Vol.I&Vol.II by T.P.Kanetkar and S.V. Kulakarni, Pune Vidyarthi GrihaPrakashan
4) Surveying Vol.I&Vol.II by S.S Bhavikatti, I.K International Publishing House.
5) Surveying Vol.I&Vol.II by S.K.Duggal, M.C.Graw Hill Publications.

**MODEL BLUE PRINT**

| S. No. | Major Topics | No. of periods | Weigh tage of marks | Marks wise Distribution of Weightage | | | | Question wise Distribution of Weightage | | | | COs Mapped |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | R | U | Ap | An | R | U | Ap | An | |
| 1 | Theodolite Survey | 16 | 17 | 3 | 6 | 8 | -- | 1 | 2 | 1 | -- | CO1 |
| 2 | Trigonometric levelling | 10 | 11 | 3 | - | 8 | -- | 1 | - | 1 | -- | CO2 |
| 3 | Tacheometry | 10 | 14 | 3 | 3 | 8 | -- | 1 | 1 | 1 | -- | CO3 |
| 4 | Curves | 16 | 14 | 3 | 3 | 8 | -- | 1 | 1 | 1 | -- | CO4 |
| 5 | Advanced surveying using GPS and GIS | 8 | 14 | 3 | 3 | 8 | -- | 1 | 1 | 1 | -- | CO5 |
| **Higher order question from any or combination of 2,3 & 4 Chapters** | | | 10 | -- | -- | -- | 10 | -- | -- | -- | 1 | CO2,CO3,CO4 |
| **Total** | | | 80 | 15 | 15 | 40 | 10 | 5 | 5 | 5 | 1 | |

R-Remember U-Understanding Ap-Application An-Analysing

**Table specifying the scope of syllabus to be covered for Unit Test-I & Unit Test-II**

| Unit Test | Learning Outcomes to be covered |
|---|---|
| Unit Test – I | From 1.1 to 2.8 |
| Unit Test – II | From 3.1 to 5.10 |

**Model Paper for Unit Test-I:**

**State Board of Technical Education and Training, A.P.**

**Diploma in Civil Engineering (DCE)**

**Third Semester:C-304 SURVEYING-II**

**Time: 90 Minutes** **Unit Test –I** **Maximum Marks : 40**

**PART- A** **16 Marks**

**Instructions :**

**(i) Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1. (a) Swinging the telescope is revolving the telescope through 180° in a vertical plane (True/False) (CO1)

   (b) Horizontal Axis of Theodolite is also called as ---------- (CO1)

   (c)When the base of the object is inaccessible two instrument stations are used (True/False) (CO2)

   (d) When the Horizontal distance between an accessible object and instrument is D and angle of elevations is A then the height of the object is H = ..... (CO2)

2. State any three errors that are eliminated by method of repetition. (CO1)
3. State three methods of traversing with a theodolite. (CO1)
4. Define (i) Latitude (ii) Departure (CO1)
5. What do you mean by Trigonometric levelling? When do you use it? (CO2)

**PART- B** **3 x 8 = 24 Marks**

***Instructions :***

**(i) Answer all questions**

**(ii) Each question carries EIGHT marks**

**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length ofthe answer.**

6. (A) Sketch and explain the parts of a Transit Theodolite. (CO1)

(OR)

(B)The table below gives the lengths and bearings of a Traverse ABCDE, the length and bearing of EA having been omitted. Calculate the length and bearing of EA. (CO1)

| Line | Length(m) | Bearing |
|---|---|---|
| AB | 204.00 | $87^0 30'$ |
| BC | 226.00 | $20^0 20'$ |
| CD | 187.00 | $280^0 00'$ |
| DE | 192.00 | $210^0 30'$ |

7. (A) Explain the detailed procedure for finding a horizontal angle by the method of reiteration. (CO1)

(OR)

(B) The following observations were obtained in a Traverse Survey, where the Length and Bearing of the last line were missing.

| Line | PQ | QR | RS | SP |
|---|---|---|---|---|
| Length (m) | 80.5 | 210.5 | 185.0 | ? |
| Azimuth | $45^0 30'$ | $120^0 42'$ | $210^0 20'$ | ? |

Calculate the length and bearing of the last line SP. (CO1)

8. (A) Determine the RL of top of Roof of a building "P", with the following observations:

| Instrument at | Staff reading on | Vertical angle | Remarks |
|---|---|---|---|
| A | 2.325 | $16^0 45'$ | AB = 40 m |
| B | 1.435 | $13^0 30'$ | RL of BM = 225.00 |

(CO2)

(OR)

(B) Describe the procedure to find the distance and elevation of the object when the base of the object is inaccessible and instrument stations and object are not in the same vertical plane. (CO2)

oOo

**Model Paper for Unit Test-II :**
**State Board of Technical Education and Training, A.P.**
**Diploma in Civil Engineering (DCE)**
**Third Semester:C-304 SURVEYING-II**

Time: 90 Minutes **Unit Test –II** Maximum Marks : 40

**PART- A** **16 Marks**

**Instructions:**

**(i) Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1. (a) A Tacheometer is used when a Theodolite is not available – True/False (CO3)
   (b) Tacheometer has _____ number of horizontal hairs (CO3)
   (c) In linear method of setting out curve, Theodolite is used ---- True/False (CO4)
   (d) The value of Radius if the value of Degree of curve D is given as 23.76m. (CO4)
2. State the methods of Tacheometry (CO3)
3. Define the terms (i) Point of intersection (ii) Mid-ordinate (CO4)
4. Briefly explain the working principle of GPS. (CO5)
5. State the components of GIS. (CO5)

**PART- B** **3 x 8 = 24 Marks**

**Instructions:**

**(i) Answer all questions**

**(ii) Each question carries EIGHT mark**

**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length ofthe answer.**

6. (A) A Tacheometer fitted with anallatic lens was set up at an intermediate station O on a line AB and the following observations were made on a vertically held staff at A and B. Take multiplying constant (f/i) =100.

| Instrument at | Staff at | Vertical angle | Stadia readings |
|---|---|---|---|
| O | A | + $15^0 30'$ | 1.850, 2.325, 3.225 |
| | B | - $05^0 30'$ | 1.175, 1.450, 1.655 |

Compute the RL of B and if the RL of A is +325.50. (CO3)

(OR)

(B)Explain the procedure for determining tacheometric constants in the field. (CO3)

7. (A) Two tangents intersect at a change of 1620 m, the deflection angle being 300. Calculate all the necessary data for setting out a circular curve of radius 320 m by the method of offsets from the chord produced, taking a peg interval of 30 m. (CO4)

(OR)

(B) Explain the procedure for setting out a curve by any one of the angular methods. (CO4)

8. (A) Explain various segments of GPS and their functioning. (CO5)

(OR)

(B) Discuss various applications of GIS in Civil Engineering. (CO5)

oOo

**Model Paper for End Examination:**

**MODEL PAPER – BOARD DIPLOMA EXAMINATION, (C–20)**

**DCE—THIRD SEMESTER EXAMINATION**

**SURVEYING-II (C-304)**

**Time: 3 hours]** **[Total Marks: 80**

**PART—A** **3×10=30 Marks**

***Instructions:*** **(1) Answer all questions.**

**(2) Each question carries three marks.**

**(3) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.**

1) Define the terms (i) Transiting (ii) Swinging (ii) Face left observation (CO1)

2) State the fundamental lines of a Transit Theodolite. (CO1)

3) Define the terms (i) Latitude (ii) Departure. (CO1)

4) State the different cases which come under trigonometric levelling. (CO2)

5) Define the situations where Tacheometry is suitable. (CO3 )

6) List the methods of tacheometery. (CO3)

7) Draw neat sketch of simple curve and name its elements. (CO4)

8) State the methods of curve setting using chain and tape. (CO4)

9) Define the terms (i) GPS (ii) GIS . (CO5)

10) State the segments of GPS. (CO5)

**PART – B** **8 x 5 = 40 marks**

**Answer either (a) or (b) from each questions from Part-B**

11) (A) Sketch and explain the parts of a Transit Theodolite. (CO1)

**(OR)**

(B)Explain various methods of Theodolite Traversing. (CO1)

12) (A) Find the R.L. of top of chimney from the following data. (CO2)

| STATION | INSTRUMENT AT | ANGLE | RL | REMARKS |
|---|---|---|---|---|
| BM | A | | 1.578 | RL OF BM 543.075 |
| C | A | $+10^0 12''$ | | DIST B/W A&B=30 |
| BM | B | | 1.269 | |
| C | B | $+8^0 20''$ | | |

**(OR)**

(B) Describe the procedure to find the distance and elevation of the object when the base of the object is inaccessible and instrument stations and object are not in the same vertical plane. (CO2)

13) (A) (i) State the principle of Tacheometery. (CO3)

(ii) Enumerate the difference between Stadia and tangential Tacheometry

**(OR)**

(B) (i) Explain stadia Tacheometery and its classification. (CO3)

(ii) Find the constants of tacheometery

| Inst. Station | staff | distance | Stadia interval |
|---|---|---|---|
| A | C | 50 | 0.495 |
| B | C | 75 | 0.745 |

14) (A)Two straight intersects at chainage 1060m and the angle of intersection is $120^0$ if the radius of the simply curve is 600m find a) tangent distance b) chainage of point of commencement c) chainage of point of tangency d) length of long cord. (CO4)

**(OR)**

(B) Explain the procedure for setting out a curve by any one angular method. (CO4)

15) (A) State the merits and demerits of GPS. (CO5)

**(OR)**

(B)State the applications of GIS in Civil Engineering. (CO5)

**PART – C**

**Question No.16 is compulsory and carries 10 marks** **10 X 1 = 10 marks**

16) Two Straights intersect at Change 1192.0m, the deflection angle being 420 . Calculate the necessary data for setting out a Curve of radius 280 m, to connect the two tangents if it is intended to set out the curve by offsets from chords. Take peg interval as 20m. (CO4)

***

# CONSTRUCTION MATERIALS

| Course Code | Course title | No. of Periods per week | Total No. of Periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-305 | Construction Materials | 04 | 60 | 20 | 80 |

| S.No | Major Topics | No. of Periods | COs Mapped |
|---|---|---|---|
| 1 | Stones | 08 | CO1 |
| 2 | Bricks | 08 | CO2 |
| 3 | Clay products & Sand | 08 | CO3 |
| 4 | Cement | 08 | CO4 |
| 5 | Mortars & Concrete | 12 | CO4 |
| 6 | Surface protective materials | 08 | CO5 |
| 7 | Timber, Plastics, Glass & Asbestos | 08 | CO5 |
| | **Total** | 60 | |

**COURSE OBJECTIVES*:***

| Upon completion of the course, the student shall be able to | | |
|---|---|---|
| **COURSE OBJECTIVES** | (i) | Familiarize with the various materials used in civil engineering constructions. |
| | (ii) | Acquire the concepts of selection of appropriate construction materials for various Civil Engineering structures /elements. |

**COURSE OUTCOMES:**

| | | | |
|---|---|---|---|
| **COURSE OUTCOMES** | CO1 | C-305.1 | Select appropriate stones and their acceptability for construction work |
| | CO2 | C-305.2 | Explain the acceptability of bricks for construction work. |
| | CO3 | C-305.3 | Explain suitability of tiles, pipes and building sand for Construction |
| | CO 4 | C-305.4 | Check the suitability of cement, mortar and concrete for various construction works |
| | CO 5 | C-305.5 | Select and apply Surface Protective Materials, Wood, Plastics, Glass and Asbestos for construction work. |

***LEARNING OUTCOMES:***

| | |
|---|---|
| **LEARNING OUTCOMES** | **1.0 Stones**<br>1.1 Give Physical classifications of rocks.<br>1.2 List characteristics of good building stone.<br>1.3 List common varieties of stone used in different items of construction and their suitability for construction works (like Granite, marble, Kadapa slabs, Shahabad stones)<br>1.4 Explain the purpose of dressing of stones.<br>1.5 Select a type of a stone for a given situation / construction.<br><br>**2.0 Bricks**<br>2.1 State the common sizes of bricks – as per IS specifications.<br>2.2 List the characteristics of good bricks.<br>2.3 List the standard tests on bricks like Water absorption test and Compressive strength test.<br>2.4 Explain Water absorption test and Compressive strength tests on brick.<br>2.5 Explain the uses of bricks for construction purposes - Refractory bricks, Fly ash bricks, Precast Solid Concrete Blocks, Hollow concrete blocks, High quality building blocks.<br><br>**3.0 Clay products & Sand**<br>3.1 State the common varieties of tiles used for different purposes.<br>3.2 List the characteristics of good tiles.<br>3.3 List the uses of porcelain and glazed tiles.<br>3.4 State the uses of stone ware pipes.<br>3.5 List the characteristics of good sand.<br>3.6 State the functions of building sand.<br>3.7 State the percentage of bulkage allowance for construction work.<br>3.8 State the need for the quarry dust as a substitute of sand.<br>3.9 Select suitable tile, pipe and fine aggregate for construction work.<br>**4.0 Cement**<br>4.1 State the chemical composition of cement.<br>4.2 State rough and ready methods of examining cement<br>4.3 Explain the method of manufacture of cement by dry process only.<br>4.4 Give the Classification of cements<br>4.5 List the three uses of various cements<br>4.6 State the different standard tests on cement.<br>4.7 Explain the tests on cement like Fineness, Consistency, Setting times and soundness.<br>4.8 State grades of cement and their compressive strengths.<br>4.9 State the importance of blended cement<br>4.10 Explain the application of blended cement with fly ash and blast furnace slag.<br><br>**5.0 Mortars and Concrete**<br>5.1 State Fine aggregate and Coarse aggregate. Explain the various tests conducted for Aggregates like water absorption and sieve analysis (Procedure of tests not necessary). |

| | | |
|---|---|---|
| | 5.2 | Give the Classification of mortars. List the proportion of mortars for various works like plastering, masonry, flooring etc., Explain the method of preparation of cement mortar |
| | 5.3 | Explain the use of super plasticiser for improving workability and strength. |
| | 5.4 | List the ingredients of PCC and RCC. State the usual proportions of plain and reinforced concrete for different items of work. |
| | 5.5 | Define Hydration of cement, Water cement ratio, Workability, Curing. Explain the importance of Hydration of cement and water cement ratio. |
| | 5.6 | Explain the method of preparing concrete. List the steps involved in preparation of concrete from mixing to curing. List different curing compounds. List the methods of curing suitable for different surfaces. |
| | 5.7 | List different tests conducted for determining the workability of concrete. Explain the procedure of conducting the following tests on concrete i.e., Slump test and Compressive strength test. |
| | 5.8 | List various types of admixtures used in concrete. List uses of admixtures used in concrete. Explain about ready mix concrete. List the advantages and disadvantages of ready-mix concrete. |
| | 5.9 | List the uses of Fly ash, Quarry dust for improving durability and resistance to adverse exposure conditions. |
| | 5.10 | Differentiate normal strength concrete and high strength concrete. Understand the following special concretes (i) Fibre reinforced concrete (ii) FAL-G concrete (iii) Light weight concrete (iv) High density concrete (v) Polymer concrete (vi) Self-compacting concrete. Explain micro concrete and shotcrete. |
| | **6.0** | **Surface Protective Materials** |
| | 6.1 | Give the composition of Paints, Enamels and Varnishes. |
| | 6.2 | List surface protective materials ie., Paints, Enamels, Varnishes, Distempers, Emulsion, French polish and Wax Polish. |
| | 6.3 | List the uses of surface protective materials. |
| | 6.4 | Apply suitable surface protective material for the given construction work. |
| | **7.0** | **Timber, Plastics, Glass & Asbestos** |
| | 7.1 | List characteristics of good timber. Define seasoning. Explain the importance of seasoning of timber |
| | 7.2 | Name common varieties of timber used in A.P for various Civil Engineering works. |
| | 7.3 | State various types of wood products used in construction work. |
| | 7.4 | List the uses of wood products used in construction work. |
| | 7.5 | List the uses of fibre reinforced plastic. |
| | 7.6 | List the merits and demerits of plastics. |
| | 7.7 | List the merits and demerits of asbestos products. |
| | 7.8 | Explain suitability of different types of glasses as a building material. |
| | 7.9 | List the merits and four demerits of glass. |
| | 7.10 | Explain suitability of Powder coated Aluminium and Steel sheets as building material. |

**PO-CO Mapping:**

| Course Code : C-305 | Course Title: CONSTRUCTION MATERIALS<br>No. of COs: 5 | | | | No. of Periods: 60 |
|---|---|---|---|---|---|
| POs | Mapped with CO No. | CO Periods addressing PO in Col 1 | | Level (1,2,3) | Remarks |
| | | No. | % | | |
| PO1 | CO1, CO2, CO3, CO4, CO5 | 40 | 67 | 3 | > 40% Level 3 (Highly addressed)<br>25% to 40% Level 2 (Moderately addressed)<br>5% to 25% Level 1 (Low addressed)<br><5% Not Addressed |
| PO2 | | | | | |
| PO3 | | | | | |
| PO4 | CO1, CO2, CO3, CO4 | 15 | 25 | 2 | |
| PO5 | CO4, CO5 | 5 | 8 | 1 | |
| PO6 | | | | | |
| PO7 | | | | | |

**CO-PO Mapping:**

| CO No. | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | | | 2 | | | | | 2 | 1 |
| **CO2** | 3 | | | 2 | | | | | 2 | 2 |
| **CO3** | 3 | | | 2 | | | | | 2 | 2 |
| **CO4** | 3 | | | 2 | 1 | | | | 2 | 2 |
| **CO5** | 3 | | | | 2 | | | | 2 | 2 |
| **Average** | 3.0 | | | 2.0 | 1.5 | | | | 2.0 | 1.8 |

**Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**

**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc**

**COURSE CONTENT**

1) **Stones**
   Classification of rocks, physical classification - Characteristics of good building stone - Common varieties of stones - granite, marble, Kadapa slab, Shahabad stones - Dressing of stones – purpose.
2) **Bricks**
   Specification for bricks as per IS-1077-1971 - Characteristics of good bricks - Testing of bricks as per IS-3495-1966 – water absorption and compressive strength test on bricks - Refractory bricks and their uses - Fly ash bricks.
3) **Clay products & Sand**
   Tiles –Types of tiles roofing tiles (Mangalore tiles), floor tiles, Ceramic tiles, Vitrified tiles, Morbonite - Characteristics of good tiles - Porcelain – glazed tiles (uses only) - Stone ware pipes – uses - Characteristics of good sand, Functions of sand - Bulking of sand – percentage

of bulking – bulkage allowance to be permitted - Crushed stone powder as substitute of sand.

**4) Cement**

Chemical composition of cement - Rough and ready method of testing cement - Methods of manufacture of cement – Dry process - Classification of cement – ordinary Portland cement, quick setting cement, white cement –Rapid hardening cement, Low heat cement, High alumina cement, Blast furnace slag cement and Pozzolana cement – uses of different types of cement - Tests on cement as per ISI – fineness, consistency, setting time, soundness tests - Blended cement.

**5) Mortars & Concrete**

Fine aggregate and course aggregate – Water absorption and sieve analysis of fine and coarse aggregates - Mortar – Classification of mortar – Lime mortar, cement mortar, Surkhi mortar, Blended mortar - Different proportions of mortars for various works - Preparation of cement mortar - Ingredients of plain concrete - Proportioning – usual proportions for different item of work - Foundation, Footings, Columns, Slabs & Beams for ordinary buildings - Plain concrete and reinforced concrete - Water cement ratio – factors effecting water cement ratio - Workability – Slump test on fresh concrete, hardened concrete – compressive strength test on hardened concrete - Admixtures – definition – types – Chemical admixtures – Plasticizers (water reducers), super plasticizers, air entraining agents, accelerators, retarders and bonding admixtures – Mineral admixtures – Pozzolanas -fly ash, ground granulated blast furnace slag, silica fume, rice husk ash and metakaoline – Gas forming – Powered zinc, powdered aluminium and hydrogen peroxide – uses - Method of preparation of concrete – Hand and machine mixing - Procedure of mixing, conveyance, placing compaction, and curing of concrete - Curing –different curing compounds - methods – suitability - Introduction to ready mix concrete – Advantages and disadvantages - Use of fly ash, quarry dust. Normal strength concrete - High strength concrete- Special concretes like Fibre reinforced concrete, FAL-G concrete, Light weight concrete, High density concrete, Polymer concrete and Self-compacting concrete - Micro concrete and Shotcrete.

**6) Surface Protective Materials**

Composition of Paints, enamels, varnishes - Types and uses of surface protective materials like Paints, Enamels, Varnishes, Distempers, Emulsion, French polish and Wax Polish.

**7) Timber, Plastics, Glass and Asbestos**

Characteristics of good timber - Seasoning of timber – Importance - Common varieties of timber used for different items of work – Doors and windows, form work, centring with particular references of A.P - Wood products-veneer – Ply wood, particle board, laminated board, straw board – Eco board - Types of plastics – fibre reinforced plastics for plastic doors and windows and water tanks - Use of asbestos – manufacture of asbestos sheets and pipes - Types of glasses and uses.

**REFERENCE:**


1. Engineering Materials by Rangwala, Charotar Publishing House Pvt. Ltd
2. Building Materials by S.K. Duggal, New age International Publishers.
3. Building materials by M.L Gambhir, Neha Jamwal, Mc.Graw Hill Publications
4. Building Materials by P.C Varghese, PHI Learning.
5. Building Materials by Ravi Kumar Sharma, I.K International Publishing House Pvt. Ltd.

## MODEL BLUE PRINT

| S. No | Major Topics | No. of periods | Weightage of marks | Marks wise Distribution of Weightage | | | | Question wise Distribution of Weightage | | | | COs Mapped |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | R | U | Ap | An | R | U | Ap | An | |
| 1 | Stones | 08 | 11 | 3 | 8 | -- | -- | 1 | 1 | - | -- | CO1 |
| 2 | Bricks | 08 | 11 | 3 | 8 | -- | -- | 1 | 1 | - | -- | CO2 |
| 3 | Clay products & Sand | 08 | 11 | 3 | 8 | -- | -- | 1 | 1 | - | -- | CO3 |
| 4 | Cement | 08 | 11 | 3 | 8 | -- | -- | 1 | 1 | - | -- | CO4 |
| 5 | Mortars & Concrete | 12 | 14 | 6 | 8 | -- | -- | 2 | 1 | - | -- | CO4 |
| 6 | Surface protective materials | 08 | 06 | 3 | 3 | -- | -- | 1 | 1 | - | -- | CO5 |
| 7 | Timber, Plastics, Glass & Asbestos | 08 | 06 | 3 | 3 | -- | -- | 1 | 1 | - | -- | CO5 |
| | **Higher order question from any or combination of 1,4,5,6&7 Chapters** | -- | 10 | -- | -- | -- | 10 | -- | -- | -- | 1 | CO1, CO4, CO5 |
| | Total | 60 | 80 | 24 | 46 | -- | 10 | 8 | 7 | -- | 1 | |

**Table specifying the scope of syllabus to be covered for Unit Test-I & Unit Test-II**

| Unit Test | Learning outcomes to be covered |
|---|---|
| Unit Test-I | From 1.1 to 4.5 |
| Unit Test-II | From 4.6 to 7.10 |

**Model Paper for Unit Test-I:**

**State Board of Technical Education and Training, A.P.**

**Diploma in Civil Engineering (DCE)**

**Third Semester: C-305 CONSTRUCTION MATERIALS**

**Time: 90 Minutes** **Unit Test –I** **Maximum Marks: 40**

**PART- A** **16 Marks**

**Instructions:**

**(i) Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks**.

1. (a) Un-stratified rocks are not layered or stratified (True/False) (CO1)

   (b) The colour of good bricks should be brown (True/False) (CO2)

   (c)The increase in the volume of sand in the presence of moisture is known as ____(CO2)

   (d) The process of making of cement was first developed by _____ (CO4)

2. List any properties of granite stone (CO1)

3. State the classification of bricks as per ISI (CO2)

4. State any three important functions of sand. (CO3)

5. Write any three usages of stone ware pipes. (CO3)

**PART- B** **3 x 8 = 24 Marks**

**Instructions:**

**(i) Answer all questions**

**(ii) Each question carries EIGHT marks**

**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A) State the physical classification of rocks. (CO1)

   (OR)

   (B) Explain any eight characteristics of a good building stone. (CO1)

7. (A) State any eight qualities of good bricks (CO2)

   **(OR)**

   (B) Explain Water absorption test and compressive strength test on bricks (CO2)

8. (A) State any eight uses of cement. (CO4)

   (OR)

   (B) Describe the method of manufacture of cement by dry process. (CO4)

***

**Model Paper for Unit Test-II:**

**State Board of Technical Education and Training, A.P.**

**Diploma in Civil Engineering (DCE)**

**Third Semester: C-305 CONSTRUCTION MATERIALS**

**Time: 90 Minutes** **Unit Test –II** **Maximum Marks: 40**

**PART- A** **16 Marks**

**Instructions:**

**(i) Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks**.

1. (a) The soundness test on cement is done by using Lechatlier apparatus (True/False)(CO4)
   (b) The process by which the moisture in the timber is reduced is known as _____of timber. (CO5)
   (c) The fluid paste prepared by dissolving a base into a vehicle along with a colouring pigment is known as _____ (CO5)
   (d) _____glass is used in the manufacture of superior quality apparatus (CO5)
2. State any six types of cements used in the construction industry. (CO4)
3. Define 'Water cement ratio' and state the effect of increased water cement ratio on concrete. (CO4)
4. Define the term 'Mortar' and state different types of mortars. (CO4)
5. State any three characteristics of good timber. (CO5)

**PART- B** **3 x 8 = 24 Marks**

**Instructions:**

**(i) Answer all questions**

**(ii) Each question carries EIGHT marks**

**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A) State different method of mixing of concrete and Describe the method of mixing of concrete by machine mixing. (CO4)

**(OR)**

(B) Explain the following types of glasses (CO5)

7. (A) Define admixture. Write short notes about (a) plasticizers and (b) super plasticizers (CO4)

(OR)

(B) State any two uses of the following : (a) Veneer (b) Plywood (c) Straw board (d) Laminated board (CO5)

8. (A) Explain 'Ready-mix concrete' and state any four advantages of ready mix concrete. (CO4)

(OR)

(B) State any four properties and four uses of 'Enamel paints' and 'Water paints'. (CO5)

***

**Model Paper for end examination:**

**MODEL PAPER – BOARD DIPLOMA EXAMINATION, (C20)**

**DCE-THIRD SEMESTER EXAMINATION**

**CONSTRUCTION MATERIALS (C-305)**

**TIME : 3 Hours]** **[ Total Marks : 80**

**PART – A** 10 x 3 = 30 marks

**Instructions : 1) Answer All Questions**

**2) Each question carries three marks**

**3) Answers should be brief and straight to the point and shall not exceed five simple sentences.**

1. Define the terms rock and stone. (CO1)
2. Name the classification of bricks as per ISI. (CO2)
3. What is meant by bulkage allowance of sand? (CO3)
4. State the classification of cement. (CO4)
5. What are the functions of mortar? (CO4)
6. Describe any two methods of curing of concrete. (CO4)
7. What are the characteristics of Distemper? (CO5)
8. State the composition of enamel paint. (CO5)
9. State any three advantages of float glass. (CO5)
10. List the merits and demerits of asbestos products (CO5)

**PART – B** **8 x 5 = 40 marks**

**Answer either (a) or (b) from each question from part-B**

11. (A) Explain the classification of stones. (CO1)

**(OR)**

(B) (i) Explain the purpose of dressing of stones . (CO1)

(ii) List characteristics of good building stone

12. (A) Describe the stages of drying and burning of bricks in the brick manufacturing process. (CO2)

**(OR)**

(B) List different tests conducted on bricks. Explain any two tests. (CO2)

13. (A) Explain the process of manufacturing stone ware pipes and mention its uses.(CO3)

**(OR)**

(B) Briefly explain the characteristics of good sand. (CO3)

14. (A) Explain the properties of Ordinary Portland cement. (CO4)

**(OR)**

(B) List different tests conducted over cement. Explain any one test. (CO4)

15. (A) Explain the procedure of conducting Initial and Final Setting Times. (CO4)

**(OR)**

(B) Differentiate normal strength concrete and high strength concrete. (CO4)

**PART – C** **10 x 1 = 10 marks**

**Question No.16 is compulsory and carries 10marks**

16. Explain Fal-G concrete and self-compacting concrete. (CO4)

***

# CONSTRUCTION PRACTICE

| Course Code | Course Title | No. of Periods per Week | Total No. of Periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-306 | Construction Practice | 04 | 60 | 20 | 80 |

| S. No. | Major Topics | No. of Periods | COs Mapped |
|---|---|---|---|
| 1. | Classification, Planning of buildings and foundations | 12 | CO1 |
| 2. | Masonry | 10 | CO2 |
| 3. | Doors, Windows and Lintels, Sunshades | 10 | CO3 |
| 4 | Roofs, Floorings and Stair Cases | 12 | CO4 |
| 5 | Scaffolding and Form work | 06 | CO5 |
| 6. | Protective, decorative finishes and Termite proofing | 10 | CO5 |
| | **TOTAL** | **60** | |

**COURSE OBJECTIVES:**

| Upon completion of the Course, the student shall be able to | | |
|---|---|---|
| **Course Objectives** | (i) | Gain useful knowledge of concepts, principles and procedures pertaining to building construction system |
| | (ii) | Understand the skills for the effective execution of building construction work, carry out repairs and maintenance works with safety and quality. |

**COURSE OUTCOMES:**

| | | | |
|---|---|---|---|
| Course Outcomes | CO1 | C-306.1 | Design of foundations as per NBC |
| | CO2 | C-306.2 | Explain general principles to be followed in construction of masonry work |
| | CO3 | C-306.3 | Explain types of doors, windows, ventilators, Lintels and sunshades for effective ventilation. |
| | CO4 | C-306.4 | Explain construction methods of roofs, different types of floor finishes and types of Stair cases |
| | CO5 | C-306.5 | Justify the arrangement of scaffolding, formwork, Protective and decorative finishes, Termite Proofing for given construction work. |

**LEARNING OUTCOMES:**

| | |
|---|---|
| **Learning outcomes** | **1.0 Classification, Planning of buildings and foundations**<br>1.1 List the components of a building. Explain the functions of the components of a building<br>1.2 Classify the buildings according to National Building Code with examples.<br>1.3 Explain the investigations required for foundation as per N.B.C.<br>1.4 Describe line diagrams of Spread footings, Raft foundation, Pile foundation and Well foundation.<br>1.5 Explain the terms Bearing capacity, Safe bearing capacity and Ultimate bearing capacity of soil.<br>1.6 State the loads to be considered in design of foundation.<br>1.7 List rules for minimum depth, width of foundation and thickness of concrete bed for spread footing foundation.<br>1.8 Explain the method of constructing spread footing foundation.<br>1.9 Lists the causes of dampness at basement level. Lists the effects of dampness at basement level. Lists the measures for prevention of dampness at basement level.<br>1.10 Introduction to Physical factors in designing a building. States various factors to be considered in planning. Inter relationship of different rooms. Aspect, prospect, furniture requirements, roominess, grouping, circulation, privacy, sanitation, elegance and economy. Explain Orientation, Ventilation, stock protection from excessive sun, rain, dust, insects etc., Case study of an existing house over the above factors<br>**2.0 Masonry**<br>2.1 List different types of stone masonry.<br>2.2 Explain the different types of stone masonry.<br>2.3 State the general principles to be observed in stone masonry construction<br>2.4 Explain Bond, Course, Header and Stretcher in brick masonry.<br>2.5 List general principles of brick masonry.<br>2.6 Explain with sketches, English bond for alternate layers brick masonry of various wall thicknesses.<br>2.7 Explain masonry with Pre-cast concrete solid blocks, Hollow blocks, high quality building blocks maintaining bond with sketches.<br><br>**3.0 Doors, windows, Lintels and sunshades**<br>3.1 State the principles of locating doors, windows and ventilators in buildings.<br>3.2 Explain with sketches common and special types of doors, windows and ventilators.<br>3.3 List the uses of different types of doors, windows and ventilators.<br>3.4 Explain the fittings and fastenings of doors, windows and ventilators.<br>3.5 Explain the functions and types of lintels.<br>3.6 Explain the functions of sunshades, canopy, sun-breakers and porticos.<br>3.7 Explain about thin lintel developed by CBRI with simple sketches. |

| | |
|---|---|
| | **4.0 Roofs, Floorings and staircases**<br>4.1 State the functions and classification of roofs.<br>4.2 State the classification of trusses based on material and shape.<br>4.3 Explain with sketches king post truss, queen post truss, fan roof truss, north light roof trusses.<br>4.4 Explain with sketches A type, B type steel trusses using structural angles and tubular sections as per the provisions of IS code.<br>4.5 State the common and decorative ceilings used in construction work. Explain the method of fixing Plaster of Paris and fibre glass ceilings.<br>4.6 State the component parts and functions of flooring. List the requirements of good floor.<br>4.7 Explain method of construction of C.C flooring, stone slab flooring, tiled flooring, mosaic flooring, Ceramic flooring, and Marble flooring.<br>4.8 Explain terms: rise, tread, landing, flight, going, hand rail, newal post, baluster and balustrade.<br>4.9 Draw the line diagrams of different stairs.<br>**5.0 Scaffolding and Formwork**<br>5.1 State the purpose of scaffolding.<br>5.2 Define scaffolding and mention the types.<br>5.3 List the component parts of tubular scaffolding.<br>5.4 Sketch and explain about tubular scaffolding.<br>5.5 State the advantages of tubular scaffolding.<br>5.6 State the principles of locating stairs.<br>5.7 State different types of formwork<br>5.8 Briefly describe the arrangement of formwork for columns, beams, slabs and walls.<br>**6.0 Protective, decorative finishes and Termite Proofing**<br>6.1 State the objects and methods of plastering. State the steps in providing cement plastering on masonry walls.<br>6.2 State the use of wall putty as a decorative finish on masonry walls.<br>6.3 State the objects and types of pointing.<br>6.4 State the objects of painting. Explain the method of painting new and old walls surfaces. State the paints suitable for painting wood work and steel work.<br>6.5 Explain briefly the method of white washing, colour washing, distempering the brick masonry wall.<br>6.6 Define termite proofing. Explain the method of termite proofing. |

**PO-CO Mapping:**

| Course Code : C-306 | Course Title: CONSTRUCTION PRACTICE<br>No. of COs : 5 | | | | No. of Periods: 60 |
|---|---|---|---|---|---|
| POs | Mapped with CO No. | CO Periods Addressing PO in Col 1 | | Level (1,2,3) | Remarks |
| | | No. | % | | |
| PO1 | CO1, CO2, CO3, CO4, CO5 | 22 | 36.7 | 2 | >40% Level 3 (Highly Addressed)<br>25% to 40% Level 2 (Moderately Addressed)<br>5% to 25% Level 1 ( Low Addressed)<br><5% Not Addressed |
| PO2 | CO1, CO4 | 6 | 10.0 | 1 | |
| PO3 | CO1 | 2 | 3.3 | | |
| PO4 | CO5 | 2 | 3.3 | | |
| PO5 | CO1, CO2, CO4, CO5 | 28 | 46.7 | 3 | |
| PO6 | | | | | |
| PO7 | | | | | |

**CO-PO Mapping:**

| CO No. | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | 1 | | 2 | | | 3 | 2 | 2 |
| **CO2** | 3 | 2 | | | 2 | | | 3 | 2 | 3 |
| **CO3** | 3 | | | | | | | 3 | 1 | 2 |
| **CO4** | 3 | 2 | | | 1 | | | 3 | 1 | 1 |
| **CO5** | 2 | 2 | | 1 | 2 | | | 3 | 2 | 3 |
| **Average** | 2.6 | 2.0 | 1.0 | 1.0 | 1.75 | | | 3 | 1.6 | 2.2 |

**Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**

**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz**

**(vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc**

## COURSE CONTENT :

**1) Classification, Planning of buildings and foundations**

Component parts of a building – Their functions - Classification of buildings according to National building code - Site investigation for foundation as per N.B.C, Trial pit, auger boring - Bearing capacity of soils –safe and ultimate bearing capacity - Spread footing foundation for columns and walls - Raft foundation - Pile foundation – RCC Piles – Bearing piles, friction piles and under reamed pile - Well foundation – component parts – sinking of well foundation - Different loads to be considered for the design of foundation as per IS 875 – 1987 - Spread foundation – Depth of foundation by Rankin's formulae– width of foundation – Thickness of concrete bed - Construction of foundation – (spread footing foundation only) - Causes, effects and prevention of dampness at basement level - Principles of planning - Orientation – factors affecting orientation, orientation criteria for Indian conditions – points for obtaining orientation - Ventilation – Stock Protection from excessive sun – sun – rain – dust – insects etc.,

**2) Masonry**

Classification of stone masonry - Ashlar, Random rubble and Coursed Rubble Masonry - General principles to be observed while constructing stone masonry - Brick Masonry - Bonds in brick masonry (English bond only) for various wall thicknesses - General principles to be observed in construction of brick masonry.

**3) Doors, Windows, Lintels and Sunshades**

Doors and windows – parts of door window – positioning - Common types of doors-panelled, Glazed and Flush doors - Special types of doors – Flush doors with modern construction materials, revolving doors, collapsible doors, rolling shutters, sliding doors, referring to A.P.D.S.S for size of doors and windows - Windows – Panelled and Glazed - Ventilators – fixed, swinging type and louvered - Fittings and fastenings for doors and windows - Lintels – Functions – Types of lintels – R.C.C., wood, stone and steel - Sunshade, canopy and sun breakers – lintel cum sunshade.

**4) Roofs, Floorings and Stair Cases**

Roof – functions of roofs - Classification of roofs – flat roofs – pitched roofs - Different types of trusses – classification based on material and shape king post truss, queen post truss, fan roof truss, north light roof truss, steel trusses of A type and B type using angular and tubular sections as per IS code - Weather proof course on R.C.C. roof - Decorative ceilings for auditoriums – method of fixing Plaster of Paris –Fibre glass - Parts of flooring – Requirements of a good floor - Methods of constructing flooring – cement concrete flooring, stone slab (Kadapa slab, Shahabad stone) floorings, cement plaster flooring, Tiled flooring, mosaic flooring-Terms: rise, tread, landing, flight, going, hand rail, newel post, baluster and balustrade-Line diagrams of different stairs- Location of stairs - Types of different stairs – straight, Quarter turn, half turn, Dog legged, open well, bifurcated, spiral/helical stair case, free standing and slab less stairs/staircase.

**5) Scaffolding and Formwork**

Scaffolding – Purpose and types – component parts of tubular scaffolding - advantages of tubular scaffolding-different types of formwork- arrangement of formwork for columns, beams, slabs and walls.

**6) Protective, decorative finishes and Termite proofing**

Plastering – purpose – Types of plastering – procedure for plastering - external finishing - sand faced, pebble dash, acoustic plastering and marble chips – Internal finishing – wall paper and wall putty finishing - Pointing – purpose –Types of pointing - Painting – objects – method of painting new and old wall surfaces, wood surface and metal surfaces – powder coating and spray painting on metal surfaces - White washing – colour washing – Distempering – internal and external walls - Termite proofing – method.

**REFERENCE BOOKS:**


1. Building Construction by Dr. B.C Punmia, Er. Ashok K.Jain, Dr. Arun K.Jain, Laxmi Publications.
2. Building Construction by Rangwala, Charotar Publications.
3. Building Construction by Sushil Kumar, Standard Publishers Distribution.
4. Building Construction by S.P. Arora & S.P. Bindra, Dhanpat Rai Publications.

**MODEL BLUE PRINT**

| S. No | Major Topics | No. of Periods | Weightage of marks | Marks wise Distribution of Weightage | | | | Question wise Distribution of Weightage | | | | COs Mapped |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | R | U | Ap | An | R | U | Ap | An | |
| 1. | Classification, planning of buildings and Foundations | 12 | 14 | 06 | 08 | -- | -- | 2 | 1 | - | -- | CO1 |
| 2. | Masonry | 10 | 11 | 03 | 08 | -- | -- | 1 | 1 | -- | -- | CO2 |
| 3. | Doors, Windows and Lintels, Sunshades | 10 | 11 | 03 | 08 | -- | -- | 1 | 1 | -- | -- | CO3 |
| 4 | Roofs, Floorings and Stair Cases | 12 | 14 | 06 | 08 | -- | -- | 2 | 1 | -- | -- | CO4 |
| 5 | Scaffolding and Form work | 06 | 06 | 06 | -- | -- | -- | 2 | -- | -- | -- | CO5 |
| 6. | Protective, decorative finishes and Termite proofing | 10 | 14 | 06 | 08 | -- | -- | 2 | 1 | -- | -- | CO5 |
| | **Higher order question from any or combination of 1,5& 6 Chapters** | -- | 10 | -- | -- | -- | 10 | -- | -- | -- | 1 | CO1, CO5 |
| | Total | 60 | 80 | 30 | 40 | -- | 10 | 10 | 5 | -- | 1 | |

**Table specifying the scope of syllabus to be covered for Unit Test-I & Unit Test-II**

| Unit Test | Learning Outcomes to be covered |
|---|---|
| Unit Test – I | From 1.1 to 3.4 |
| Unit Test – II | From 3.5 to 6.6 |

**Model Paper for Unit Test-I :**

**State Board of Technical Education and Training, A.P.**

**Diploma in Civil Engineering (DCE)**

**Third Semester ::C-306 CONSTRUCTION PRACTICE**

**Time: 90 Minutes** **Unit Test –I** **Maximum Marks: 40**

**PART- A** **16 Marks**

**Instructions:**

**(i) Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1. (a) The full form of NBC is National Building Company – True/False (CO1)
   (b) Full from of DPC is ---------- (CO1)
   (c) Queen closer is a brick of full length and thickness but half the width -- True/FalseCO2)
   (d) The depression made in the brick on its surface during manufacturing is called.....CO2)
2. Define the term Bearing Capacity? What is the necessity of finding it for soils? (CO1)
3. Draw the top view of two consecutive layers of one brick wall built in English bond. (CO2)
4. State three principles of locating doors in buildings. (CO3)
5. State three types of windows. (CO3)

**PART- B** **3 x 8 = 24 Marks**

**Instructions:**

**(i) Answer all questions**

**(ii) Each question carries EIGHT marks**

**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A) Explain the classification of buildings as per NBC with examples. (CO1)

   (OR)

   (B)Explain the investigations required for foundation as per N.B.C. (CO1)

7. (A) State the general principles to be observed in stone masonry construction. (CO2)

   (OR)

   (B) Explain with sketches, construction of Masonary wall in English bond for alternate layers of one and half brick wall thicknesses. (CO2)
8. (A) Explain the component parts of a Panelled Door with the help of a sketch. (CO3)

   (OR)

   (B) List out common types and special types of doors and windows. (CO3)

oOo

**Model Paper for Unit Test-II :**

**State Board of Technical Education and Training, A.P.**
**Diploma in Civil Engineering (DCE)**
**Third Semester:: C-306 CONSTRUCTION PRACTICE**

**Time: 90 Minutes** **Unit Test –II** **Maximum Marks : 40**

**PART- A** **16 Marks**

**Instructions:**

**(i) Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1. (a) A lintel is constructed above openings to increase the strength of wall.. True/False(CO3)

   (b) The trusses provided in workshops by the use of glazing on steeper pitch for lighting purpose are called ---------- (CO3)

   (c) Steel scaffolding is generally not preferred as it rusts quickly -- True/False (CO5)

   (d) The temporary support for forming structural building components is known as .(CO5)

2. State any three functions of Lintels? (CO3)

3. Draw the line diagrams of any three types of stair cases. (CO4)

4. State the advantages of Steel formwork over timber formwork. (CO5)

5. State the necessity of termite proofing in buildings. (CO5)

**PART- B** **3 x 8 = 24 Marks**

**Instructions :**

**(i) Answer all questions**

**(ii) Each question carries EIGHT mark**

**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length ofthe answer.**

6. (A) Explain the functions of Sunshade, canopy and sun breakers. (CO3)

(OR)

(B)Sketch and explain (i) Kingpost Truss (ii) Queen Post Truss . (CO4)

7. (A) Describe the construction of Mosaic Flooring . (CO4)

(OR)

(B) Explain the method of providing weather proof course on roofs. (CO4)

8. (A) Explainthe method of powder coating and spray painting on metal surfaces. (CO5)

(OR)

(B) Describe the method of painting a new wall surface. (CO5)

oOo

**Model paper for end examination:**

**MODEL PAPER – BOARD DIPLOMA EXAMINATION, (C–20)**

**DCE—THIRD SEMESTER EXAMINATION**

**CONSTRUCTION PRACTICE (C-306)**

**Time: 3 hours]** **[Total Marks: 80**

**PART—A** **3×10=30 Marks**

**Instructions: (1) Answer all questions.**

**(2) Each question carries three marks.**

**(3) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.**

1. State any three objectives of soil exploration. (CO1)
2. State the situations under which under reamed piles are used. (CO1)
3. Define the following terms (CO2)

   (ii) Header (ii) Stretcher (iii) Course.
4. State any three functions of sun shade. (CO3)
5. List any six types of trusses used in pitched roofs. (CO4)
6. Draw the line plan of doglegged and open newel stair case. (CO4)
7. List any four types of scaffolding. (CO5)
8. Write any four advantages of steel formwork over wooden form work. (CO5)
9. How do you prepare the surface for painting new metal grill work? (CO5)
10. State any four objects of plastering. (CO5)

**PART – B** **8 x 5 = 40 marks**

**Answer either (a) or (b) from each questions from Part-B**

11. (A) (i) Explain briefly an auger method of soil investigation.

    (ii) What are the situations that demand a pile foundation?. (CO1)

**(OR)**

(B) Draw a neat sketch of well foundation and explain method of construction.(CO1)

12. (A) State any eight general principles to be observed during stone masonry construction. (CO2)

**(OR)**

(B) Sketch the plan of alternate courses of English bond wall at corner.(CO2)

13. (A) State and explain any four common special types of doors. (CO3)

**(OR)**

(B) Write short notes on the following : (CO3)

(i) Sunshade (ii) Canopy (iii) Sun-breakers.

14. (A) Explain the method of construction of mosaic flooring. (CO4)

**(OR)**

(B)State the principles of location of staircase. (CO4)

15. (A) State three objects of pointing and describe the method of flush pointing. (CO5)

**(OR)**

(B)What is meant by termite proofing? Explain the method of anti-termite treatment for the soil before construction ofbuilding. (CO5)

**PART – C**

**Question No.16 is compulsory and carries 10 marks** **10 x1 = 10 marks**

16. Explain briefly the functions of any ten components of a building. (CO1)

***

# CIVIL ENGINEERING DRAWING-I

| Course Code | Course Title | No. of Periods per Week | Total No. of Periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-307 | CIVIL ENGINEERING DRAWING-I | 06 | 90 | 40 | 60 |

| S.No. | Major Topics | No. of Periods | COs Mapped |
|---|---|---|---|
| 1 | Introduction | 9 | **CO1** |
| 2 | Residential Buildings | 45 | **CO2** |
| 3 | Public and Industrial Buildings | 21 | **CO3** |
| 4 | Working drawings | 15 | **CO4** |
| | **Total** | 90 | |

**COURSE OBJECTIVES:**

| Upon completion of the Course, the student shall be able to | | |
|---|---|---|
| COURSE OBJECTIVES | (i) | Apply the standard practices in building drawing, understand setbacks, orientation of buildings and Vaastu Shastra. |
| | (ii) | Prepare drawings of different components of building, site plans, single storeyed buildings, line drawings of public & industrial buildings with fire safety, working drawings manually. |

**COURSE OUTCOMES:**

| | | | |
|---|---|---|---|
| COURSE OUTCOMES | CO1 | C-307.1 | Practice drawing different components of buildings and drawing site plans as per local bye laws, orientation of buildings and Vaastu Shastra. |
| | CO2 | C-307.2 | Practice drawing plan, elevation and section of residential buildings, framed structures, given line diagram and specifications. |
| | CO3 | C-307.3 | Draw the line diagrams of Hospitals, Hostels, Schools and Apartments for the given requirements with fire safety and provision for Physically disabled and aged people. |
| | CO4 | C-307.4 | Draw the working drawings for foundation marking, electrical layout, provision of lift and solar water heater. |

LEARNING OUTCOMES:

| | | |
|---|---|---|
| LEARNING OUTCOMES | **1.0** | **INTRODUCTION** |
| | 1.1 | Sketch the conventional signs of Civil Engineering materials, Plumbing and Electrical fixtures. |
| | 1.2 | Draw the cross section of load bearing wall and name all components below and above ground level. |
| | 1.3 | Draw the plan of one Brick wall meeting at corner showing alternative courses of header and stretchers in English bond. |
| | 1.4 | Draw the following views of a fully panelled door and label the parts<br>1. Elevation and<br>2. Sectional plan |
| | 1.5 | Draw the following views of fully panelled window and glazed window and label the parts.<br>1. Elevation and 2. Sectional plan |
| | 1.6 | Draw the following views of glazed window and label the parts.<br>1. Elevation and 2. Sectional plan |
| | 1.7 | Draw the elevation of the following trusses and label the parts with the given data (details of joints not required)<br>1. King post truss and 2. Queen post truss |
| | **2.0** | **RESIDENTIAL BUILDINGS** |
| | 2.1 | Draw the site plan of a residential building as per local byelaws and NBC (National Building Code). |
| | 2.2 | Draw the following views of single storeyed load bearing type residential building from the given line diagram and set of specifications for a) One room with veranda b) one-bedroom house c) two-bedroom house<br>1. Plan<br>2. Section and<br>3. Elevation |
| | 2.3 | Draw the following views of single storied framed structure type residential building from the given line diagram and set of specifications for a) One-bedroom house b) Two-bedroom house<br>1. Plan,<br>2. Section and<br>3. Elevation |
| | 2.4 | Draw the following views of a dog legged stair with given specifications.<br>1. Plan, and 2. Section |
| | 2.5 | Draw the following views of two- storied residential building (framed Structure) from the given the line diagram and set of specifications.<br>1. Plans of first and second floors and<br>2. Elevation |
| | 2.6 | Prepare the drawings in the standard format for obtaining sanction from a local body for a residential building (Two storeyed, two bed room building) including a rain water harvesting structure |

| | |
|---|---|
| | 2.7 Principles of Vastu with Scientific approach.<br><br>**3.0 PUBLIC AND INDUSTRIAL BUILDINGS**<br>3.1 Rural hospital of 10 beds capacity<br>3.2 Hostel for 50 students<br>3.3 Primary school of 250 to 300 students<br>3.4 Apartments - Plan of one floor with 6 to 10 units @ 90 –150 sq.m /unit<br>3.5 Provisions of Fire Safety<br>3.6 Provision for Physically disabled and aged people.<br><br>**4.0 WORKING DRAWINGS**<br>4.1 Prepare a working drawing for the purpose of marking the width of foundation for the given plan of a building<br>4.2 Calculate the following for the given plan of a building<br>1. Plinth area,<br>2. Carpet area and<br>3. Floor area ratio/ Floor spaces Index.<br>4.3 Prepare a working drawings for electrical layout for a given residential building ( 2 bed room buildings-ground floor only).<br>4.4 Draw the plan and cross section of a lift shaft or a multi storeyed building.<br>4.4 Draw the typical layout of active solar water heating system. |

**PO-CO Mapping:**

| **Course Code: C-307** | **Course Title: Civil Engineering Drawing – I<br>No. of COs: 4** | | | | **No. of Periods: 90** |
|---|---|---|---|---|---|
| **POs** | **Mapped with CO Nos.** | **CO periods addressing PO in Col.1** | | **Level (1,2,3)** | **Remarks** |
| | | **No.** | **%** | | |
| PO1 | 1,2,3,4 | 17 | 19 | 1 | >40% Level.3 (Highly addressed)<br>25% - 40% Level.2 (Moderately addressed<br>5% - 25% Level.1 (Low addressed)<br><5% Not addressed |
| PO2 | 1,2,3,4 | 43 | 48 | 3 | |
| PO3 | 1,2,3,4 | 30 | 33 | 2 | |
| PO4 | | | | | |
| PO5 | | | | | |
| PO6 | | | | | |
| PO7 | | | | | |

**CO-PO Mapping:**

| CO No. | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | | | | | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | | | | | 3 | 3 | 3 |
| CO3 | 2 | 2 | 2 | | | | | 3 | 3 | 3 |
| CO4 | 2 | 2 | 2 | | | | | 3 | 3 | 3 |
| Average | 2.5 | 2.5 | 2.5 | | | | | 3 | 3 | 3 |

**Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**

**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc**

## COURSE CONTENT

**1.0 Introduction**

1.1 Conventional signs for materials like bricks, stone, concrete, wood, glass, earth, steel and electrical fixtures like ceiling fan, bulb, main switch, refrigerator, bell push, buzzer, A.C motor, and water supply and sanitary fixtures like tap, wash basin, sink, W.C pan (Indian and European type), shower, flush tank.

1.2 Cross section of a load bearing wall showing all the components below and above the ground level.

1.3 Plan of one brick wall meeting at a corner showing odd and even courses in English bond,

1.4 Plan and Cross section of a Fully panelled door

1.5 Plan and Cross section of a Fully panelled window and glazed window showing all the component parts

1.6 Elevation of King post and Queen post trusses with the given Data (details of joints not required)

**2.0 Residential Buildings**

2.1 Setbacks and orientation principles for planning residential buildings as per local bye laws and NBC.

2.2 Single storied two bed room load bearing residential building

2.3 Single storied framed structure two-bedroom residential building

2.4 Two-storied residential building (framed structure type)

2.5 Dog legged stair

2.6 The standard format for obtaining sanction from local body for a residential Building (up to two-bedroom building–G+1 floors) including a rainwater harvesting structure.

2.7 Principles of Vastu with Scientific approach

**3.0 Public and industrial buildings**

Draw the line diagrams only showing the functional requirements of

3.1 Rural hospital of 10 beds capacity

3.2 Hostel for 50 students

3.3 Primary school of 250 to 300 students

3.4 Apartments - Plan of one floor with 6 to 10 units @90 – 150 sq.m / unit

3.5 Provisions of Fire Safety

3.6 Provision for Physically disabled and aged people.

**4.0 Working drawings**

4.1 Working drawing for the purpose of marking from the given plan and width of foundation.

4.2 Calculates the following for the given plan of a building
1. Plinth area,
2. Carpet area and
3. Floor area ratio/ Floor spaces Index.

4.3 Prepares a working drawings for electrical layout for a given residential building ( 2 bed room buildings-ground floor only).

4.4 Draws the plan and cross section of a lift shaft or a multi storeyed building.

4.5 Draws the typical layout of active solar water heating system.

**REFERENCE BOOKS:**


1. Civil Engineering Drawing by Chakraborthy, UBS Publications.
2. Civil Engineering Drawing & House Planning by B.P Verma, Khanna Publishers.
3. Building Planning & Drawing by Dr.N.Kumara swamy, A.Kameswararao, Charotar Publishing House Pvt.Ltd.
4. Building Planning & Drawing by S.S Bhavikatti, M.V Chitawadagi, I.K International publishing house Pvt.Ltd.


**MODEL BLUE PRINT**

| S. No | Major Topics | No. of periods | Weightage of marks | Marks wise Distribution of Weightage | | | | Question wise Distribution of Weightage | | | | COs Mapped |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | R | U | Ap | An | R | U | Ap | An | |
| 1 | Introduction | 09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | |
| 2 | Residential Buildings | 45 | 20 | | 20 | | | | 1 | | | CO1 & CO2 |
| 3 | Public and Industrial Buildings | 21 | 20 | | 20 | | | | 1 | | | CO1 & CO3 |
| 4 | Working drawings | 15 | 20 | | 20 | | | | 2 | | | CO1, CO2, CO3& CO4 |
| | | Total | 60 | | 60 | | | | 4 | | | |

**Note:** In question paper, Part –A consists of two questions of 10 marks each from the chapter 4 (Working drawings) and Part –B consists of two questions of 20 marks each from the chapters 2 (Residential Buildings) and 3 (Public and Industrial Buildings)

**MODEL PAPER – BOARD DIPLOMA EXAMINATION, (C–20)**

**DCE—THIRD SEMESTER EXAMINATION**

**CIVIL ENGINEERING DRAWING- I (C-307)**

**Time: 3 hours]** **[Total Marks:60**

**PART—A** **2×10=20 Marks**

***Instructions:*** **(1) Answer all questions.**

**(2) Each question carries tenmarks.**

**(3) All parts must be drawn to scale.**

**(4) Any missing data may be assumed suitably.**

1. Draw the plan and sectional elevation of a dog legged staircase to a scale of 1:50 with the following specifications:
   a) Room Dimensions : 5 m x 3 m
   b) Wall thickness : 300 mm
   c) Width of flight : 1.50 m
   d) Width of landing : 1.5 m
   e) Floor to floor height : 3.0 m
   f) Thickness of waist slab : 150 mm
   g) Rise of step : 150 mm
   h) Tread of step : 300mm (CO1)

2. Draw the working drawing for the purpose of marking the width of foundation of single room building of size 4 m × 5 m with superstructure wall of 200 mm thick and the width of footing is 700 mm. (CO4)

**PART-B** **2×20=40 Marks**

***Instructions:*** **(1) Answer all questions.**

**(2) Each question carries twentymarks.**

**(3) All parts must be drawn to scale.**

**(4) Any missing data may be assumed suitably.**

3. The line diagram of a residential building showing the internal dimensions of the rooms is shown in the Fig. 2. from the given specifications, draw the following views to the scale of 1 :100 :
   *(a)* Detailed plan*(b)* Section along ABCD

***Specifications*** **:**

**Foundation :** The depth of foundation shall be 900 mm below the ground level. The PCC (1 : 4 : 8) bed in the foundation will be 900 mm wide and 200 mm deep. The footing shall be of stone masonry in CM (1 : 4) with width of first and second footing will be 600 mm and 500 mm respectively and the depth of first and second footing will be 300 mm and 300 mm respectively.

**Basement :** The height of basement is 450 and width is 400 mm in brick masonry in CM (1 : 4) DPC shall be provided under the super structure walls with 50 mm thick.

**Super structure :** The walls of super structure will be brick masonry CM (1 : 6) is 3·3 m from the floor to bottom of the RCC slab. Width of the wall is 300 mm. For toilets the partition wall is100 mm thick from floor level.

**Lintels and Sun shades :** Lintels with RCC (1 : 2 : 4) are provided on all openings with depth 150 mm and bearings of 150 mm on either side. Sun shades are provided on all the outer doors and windows. Sunshade is 100 mm thick at the wall face and 75 mm at free end and projection of 600 mm from the face of the wall.

**Roofing :** Roofing consist of RCC (1 : 2 : 4) slab 140 mm thick and weather proof course of 25 mm thick over slab.

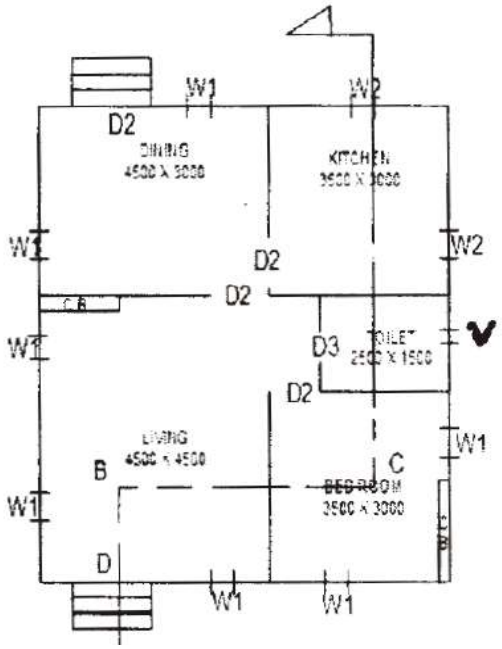
**Flooring :** Flooring shall be of Cuddapah slab 25 mm thick over CC (1 : 5 : 10) of 100 mm thick over sand filling in the basement.

**Parapet :** Parapet wall is 100 mm thick and 750 mm height with brick masonry in CM : (1 : 4) shall be constructed all around the building. A coping of 150 mm × 50 mm thick shall be provided over the parapet.

**Steps :** Steps of 1200 mm wide are provided with brick masonry in CM (1 : 6) on both front ad rear sides and rest on CC (1 : 4 : 8) bed 150 mm and having offset on the three sides equal to 100 mm Tread of each step is 250 mm and rise is 150 mm.

**Doors and Windows :** Reference.

D1 – Flushed door – 1000 mm × 2100 mm
D2 – Flushed door – 900 mm × 2100 mm
D3 – Flushed door – 750 mm × 2100 mm
W1 – Window – 1800 mm × 1500 mm
W2 – Window – 1200 mm × 1050 mm
CB – Cupboard – 1800 mm × 2000 mm
V – Ventilator – 600 mm × 450 mm




CO2)

4. Draw the line diagram showing the functional requirements of Elementary school building consisting five class rooms, store room, staff room, room for Head master, common toilets for boys, girls, and staff separately to a suitable scale. (CO3)

## SURVEYING-II PRACTICE & PLOTTING

| Course Code | Course Title | No. of Periods per Week | Total No. of Periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-308 | SURVEYING-II PRACTICE & PLOTTING | 04 | 60 | 40 (30 for class exercises + 10 for Survey camp) | 60 |

| S.No. | Major Topics | No. of Periods | COs Mapped |
|---|---|---|---|
| 1. | Theodolite Survey | 20 | CO1 |
| 2. | Trigonometric Levelling | 8 | CO2 |
| 3. | Tacheometry | 12 | CO3 |
| 4. | Curves | 12 | CO4 |
| 5. | Plotting | 8 | CO1,CO2,CO3,CO4 |
| | **Total** | **60** | |
| 6. | A Survey camp, immediately after completion of all exercises, shall be conducted for 4 days during 6 AM to 12 noon & 2PM to 5 PM on each day followed by one day break and 2 days of plotting from 9AM to 5 PM, with one hour lunch break. (25% of total sessional marks shall be allocated to this activity. The skills learnt during class exercises during I year & III semester shall be demonstrated in a simulated field like situation and shall be assessed appropriately) | 7 days (Additional instructional duration & NOT to be included in the above 60 periods) | CO1,CO2,CO3,CO4 |

***COURSE OBJECTIVES:***

| Upon completion of the Course, the student shall be able to | | |
|---|---|---|
| Course Objectives | 1 | Develop knowledge about surveying instruments & methods adopted to carry out Field Survey with a professional approach. |
| | 2 | Develop skills in students in using Theodolite and curve setting. |

**COURSE OUTCOMES:**

| | | | |
|---|---|---|---|
| **Course Outcomes** | CO1 | C-308.1 | Apply the knowledge of Theodolite in different operations in civil engineering projects and to plot from field data. |
| | CO2 | C-308.2 | Apply the principles of Trigonometrical Levelling and computation of distance and elevation for different conditions and to plot from field data. |
| | CO3 | C-308.3 | Find the constants of Tacheometer and apply principles of Tacheometry and compute the distances and elevations for different conditions. |
| | CO4 | C-308.4 | Compute the elements of Simple curve and sets the Simple Curve by using different methods and to plot from field data. |

**LEARNING OUTCOMES:**

| | |
|---|---|
| LEARNING OUTCOMES | **1.0 Theodolite Surveying**<br>• Identify the component parts of a theodolite<br>• Perform temporary adjustment of theodolite.<br>• Measure horizontal angle by repetition method and record the observations in the field book<br>• Measure horizontal angles by reiteration methodand record the observations in the field book<br>• Measure Vertical angles and record the observations in the field book<br>• Prolong a given survey line by double transiting method<br>• Measure the horizontal distance between two inaccessible points using theodolite<br>• Measure bearing of a survey line<br>• Conduct (i) Theodolite traversing (closed) (ii) Compute latitudes and departures and (iii)Calculate the area of traverse<br>**2.0 Trigonometric Levelling**<br>• Determine the Horizontal and Vertical Distance of an object whose base is accessible<br>• Determine the Horizontal and Vertical Distance of an object whose base is inaccessible and the two instrument stations and the object in the same vertical plane<br>• Determine the Horizontal and Vertical Distance of an object whose base is inaccessible and the two instrument stations and the object are not in the same vertical plane |

| | |
|---|---|
| | **3.0 Tacheometry**<br>• Determine the Tacheometric constants 'K' and 'C'.<br>• Determine Horizontal Distance and Elevation by principle of stadia Tacheometry.<br>**4.0 Curves**<br>• Sets out Simple Curve using Chain and Tape.<br>• Sets out Simple Curve using One Theodolite.<br>• Sets out Simple Curve using Two Theodolites.<br>**5.0 Plotting**<br>• Measure the horizontal distance between two inaccessible points by plotting the data observed in theodolite survey<br>• Plot the closed traverse of theodolite, distribute the closing error by Bowditch / transit rule<br>• Calculate the area of traverse from the traverse Plotting<br>• Plot the Simple curve after setting out in the field |

**PO-CO Mapping:**

| **Course Code: C-308** | **Course Title: SURVEYING –II PRACTICE & PLOTTING**<br>**No of COs : 4** | | | | **No. Of periods: 60** |
|---|---|---|---|---|---|
| **POs** | **Mapped with CO No** | **CO Periods Addressing PO in Col 1** | | **Level (1,2,3)** | **Remarks** |
| | | **No** | **%** | | |
| 1 | CO1, CO2, CO3, CO4 | 5 | 8.3 | 1 | >40% Level.3 (Highly addressed)<br>25% - 40% Level.2 (Moderately addressed)<br>5% - 25% Level.1 (Low addressed)<br><5% Not addressed |
| 2 | CO1, CO2, CO3, CO4 | 15 | 25 | 2 | |
| 3 | CO1, CO2, CO3, CO4 | 25 | 41.7 | 3 | |
| 4 | CO1, CO2, CO3, CO4 | 6 | 10 | 1 | |
| 5 | CO1, CO2, CO3, CO4 | 5 | 8.3 | 1 | |
| 6 | CO1, CO2, CO3, CO4 | 4 | 6.7 | 1 | |
| 7 | | | | | |

**CO-PO Mapping:**

| CO No. | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | 2 | 2 | 2 | 2 | | 3 | 3 | 3 |
| **CO2** | 2 | 3 | 2 | 2 | 2 | 2 | | 3 | 3 | 3 |
| **CO3** | 3 | 2 | 3 | 3 | 3 | 3 | | 3 | 3 | 3 |
| **CO4** | 3 | 2 | 2 | 2 | 3 | 3 | | 3 | 3 | 3 |
| **Average** | 2.5 | 2.25 | 2.25 | 2.25 | 2.5 | 2.5 | | 3 | 3 | 3 |

**Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**

**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz**

**(vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc**

**COURSE CONTENT:**

**1.0 Theodolite surveying**

a) Identification of the component parts of a theodolite
b) Performing temporary adjustment of theodolite.
c) Measurement of horizontal angle by repetition method and record the observations in the field book
d) Measurement of horizontal angles by reiteration method and record the observations in the field book
e) Measurement of Vertical angles and record the observations in the field book
f) Prolonging a given survey line by double transiting method
g) Measurement of the horizontal distance between two inaccessible points using theodolite
h) Measurement ofbearing of a survey line
i) Conducting (i) Theodolite traversing (closed) (ii) Compute latitudes and departures and (iii) Calculate the area of traverse

**2.0 Trigonometric Levelling**

a) Determination of the Horizontal and Vertical Distance of an object whose base is accessible
b) Determination of the Horizontal and Vertical Distance of an object whose base is inaccessible and the two instrument stations and the object in the same vertical plane
c) Determination of the Horizontal and Vertical Distance of an object whose base is inaccessible and the two instrument stations and the object are not in the same vertical plane

**3.0 Tacheometry**

a) Determination of Constants of Tacheometer
b) Determination of Horizontal distance and elevation by stadia Tacheometry.

**4.0 Curves**

a) Setting out a simple curve by chain and tape method.
b) Setting out a simple curve by one Theodolite
c) Setting out a simple curve by two Theodolite methods.

**5.0 Plotting**

a) Measurement of horizontal distance between two inaccessible points by plotting the data observed in theodolite survey
b) Plot the closed traverse of theodolite, distributing the closing error by Bowditch / transit rule and calculate the area of traverse
c) Plot the Simple curve after setting out inthe field

**KEY competencies to be achieved by the student**

| S.No. | Experiment Title | Key Competency |
|---|---|---|
| 1 | Field Exercises in Theodolite Surveying<br>Ex 1.1<br>Ex 1.2<br>Ex 1.3<br>Ex 1.4<br>Ex 1.5<br>Ex 1.6<br>Ex.1.7<br>Ex.1.8<br>Ex 1.9<br>Ex 1.10 | • Identify the component parts of a theodolite, Perform temporary adjustments of theodolite.<br>• Measure horizontal angles.<br>• Record the observations in the field book.<br>• Measure horizontal angle by repetition method.<br>• Measure horizontal angles by reiteration method.<br>• Measure Vertical angles.<br>• Prolong a given survey line by double transiting method.<br>• Measure the horizontal distance between two inaccessible points using theodolite.<br>• Measure bearing of a survey line.<br>• Conduct theodolite traversing (closed), Compute latitudes and departures, Calculate the area of |

| | | |
|---|---|---|
| | | traverse. |
| 2 | Field Exercises in Trigonometric levelling<br>Ex 2.1<br><br>Ex 2.2<br><br>Ex 2.3 | • Determine the Horizontal and Vertical Distance of an object whose base is accessible<br><br>• Determine the Horizontal and Vertical Distance of an object whose base is inaccessible when the two instrument stations and the object are in the same vertical plane<br><br>• Determine the Horizontal and Vertical Distance of an object whose base is inaccessible when the two instrument stations and the object are not in the same vertical plane |
| 3 | Field Exercises in Tacheometric Survey<br>Ex 3.1<br><br>Ex 3.2 | • Determine the Tacheometric constants 'K' and 'C'<br><br>• Determine Horizontal Distance and Elevation by principle of stadia tacheometry |
| 4 | Field Exercises in Curves<br>Ex 4.1<br><br>Ex 4.2<br><br>Ex 4.3 | • Sets out Simple Curve using Chain and Tape.<br>• Sets out Simple Curve using One Theodolite.<br>• Sets out Simple Curve using Two Theodolites |

# MATERIAL TESTING PRACTICE

| Course code | Course title | No. of period/week | Total no. of periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-309 | Material Testing Practice | 03 | 45 | 40 | 60 |

| S.No. | Topics | No. of periods | COs Mapped |
|---|---|---|---|
| 1 | Tests on bricks | 12 | CO1,CO2,CO3,CO4,CO5 |
| 2 | Tests on Cement | 12 | CO1,CO2,CO3,CO4,CO5 |
| 3 | Tests on Aggregates | 15 | CO1,CO2,CO3,CO4,CO5 |
| 4 | Tests on metals | 06 | CO1,CO2,CO3,CO4,CO5 |
| | Total | 45 | |

**COURSE OBJECTIVES:**

| Upon completion of the course, the student shall be able to | | |
|---|---|---|
| **Course objectives** | (i) | Familiarize with the knowledge of different materials, tools used in Material Testing Lab. |
| | (ii) | Use various basic implements used in testing of various Civil Engineering construction materials. |
| | (iii) | Know the etiquette of working with the fellow work force |
| | (iv) | Reinforce theoretical concepts by conducting relevant experiments/exercises. |

**COURSE OUTCOMES:**

| | | | |
|---|---|---|---|
| **Course Outcomes** | CO1 | C-309.1 | Demonstrate the skill of planning and organising experimental set up for conducting various tests on Civil Engineering construction materials |
| | CO2 | C-309.2 | Perform precise operations/tasks with Engineering equipment/instrument used for testing of different Civil Engineering construction materials |
| | CO3 | C-309.3 | Observe various parameters, their variations and graphically represent the same |
| | CO4 | C-309.4 | Analyse the experimental results to draw inferences, to make recommendations |
| | CO5 | C-309.5 | Practice ethics & etiquette while working in a group and display professionalism while communicating as a member and leading group. |

**LEARNING OUTCOMES:**

| | |
|---|---|
| **LEARNING OUTCOMES** | **1.0 Tests on bricks**<br>**(a) Water absorption test on bricks**<br>• Using of balance to weigh bricks and recording its weight.<br>• Placing the specimen/ bricks in an oven at const. temperature.<br>• Placing the end of the bricks in the dish, the depth of immersion in water being 25 mm.<br>• Giving identification marks to bricks.<br>• Immersing the bricks at a given temperature.<br>• Wiping out water traces.<br>• Placing the whole arrangement in a warm (for example,20 to 30°C ) well ventilated room<br>• Heating the specimen/ bricks in an oven at constant temperature.<br>• Calculating % of water absorption.<br>• Examining the bricks for efflorescence after the second evaporation and report the results.<br>**(b) Crushing Strength test on bricks**<br>• Operation of compression Testing machine /UTM.<br>• Placing of bricks in CTM.<br>• Applying of load gradually at the rate of 14N/$mm^2$/min Switching off the CTM.<br>• Taking adequate no of bricks randomly.<br>• Cleaning the surface of bricks.<br>• Immersing the bricks in clean water tub.<br>• Wiping off the surface of bricks with cloth after taking from water tub.<br>• Applying CM 1:1 on the rough surfaces and filling up the frog with prepared CM.<br>• Storing of plastered bricks under jute bags for 24 hours and immersing in clean water for 3days.<br>• Wiping off surplus water after removing from clean water.<br>• Preparing 1:1 cement mortar.<br>• Applying the load gradually at the rate of 14 N/$mm^2$ per minute till failure occurs.<br>• Recording the load at failure(crushing)<br>• Tabulating the observations. |

| | |
|---|---|
| | • Calculating the average crushing strength.<br>**2.0 Tests on cement**<br>**(a) Fineness Test on cement**<br>• Selecting the required IS sieve No.9.<br>• Weighing cement.<br>• Sieving of cement.<br>• Weighing of residue after sieving<br>• Calculating % of residue of cement left on the pan.<br>**(b) Normal Consistency Test on Cement**<br>• Weighing of cement.<br>• Transferring of cement into non-absorbent tray.<br>• Using of stopwatch.<br>• Measuring the required % of water.<br>• Reading of Vicat's scale/noting down the plunger penetration and recording.<br>• Mixing cement with water and transferring the paste into mould within gauge time.<br>• Releasing of Vicat's plunger to penetrate into the paste.<br>• Reading of Vicat's scale/noting down the plunger penetration and recording.<br>• Reading of Vicat's scale/noting down the plunger penetration and recording.<br>• Repeating the process varying % of water and noting the penetration of plunger from the bottom of the mould till the penetration value is between 5-7mm.<br>**(c) Setting Time Test on cement**<br>• Weighing of cement.<br>• Transferring cement into non-absorbent tray.<br>• Using of stopwatch.<br>• Measuring the required % of water<br>• Mixing cement with water and transferring the paste into mould within gauge time.<br>• Releasing of Vicat's needle to penetrate into the paste<br>• Reading of Vicat's scale/noting down the needle penetration and recording.<br>• Repeating the procedure until the needle, when brought in contact with the cement block and released, fails to pierce the block between 5-7 mm measured from the bottom of the mould. |

| | |
|---|---|
| | **(d) Compressive Strength of cement**<br>• Using of stopwatch.<br>• Operating the vibrating machine for uniform compaction<br>• Operating the compression testing machine<br>• Transferring the cement into non-absorbent tray.<br>• Mixing cement with water and transferring the paste into mould within gauge time.<br>• Filling of mixed cement mortar into standard mould<br>• Weighing of cement.<br>• Mixing of 3 grades of Ennore sand.<br>• Measuring of water (P/5 +3.5) % of combined weight of cement and sand.<br>• Reading the compressive strength of cubes and recording<br>**3.0 Tests on Aggregates**<br>**(a) Water absorption test on sand**<br>• Taking appropriate quantity of fine aggregate (sand) and clean it thoroughly by washing it thorough 75µ sieve till the fine dust is fully removed.<br>• Finding weight of sand in pycnometer and pouring distilled water till sand in inundated. Cleaning the pycnometer on its outside surface and finding its weight after 24 hours saturation and let the weight be "A".<br>• Emptying the pycnometer and filling it with distilled water only. Taking its weight "B".<br>• Cleaning the aggregate with soft clothes until the aggregate become saturated surface dry and let its weight be "C".<br>• Keeping the aggregate in oven for drying at a temperature of 110oc for period of 24hours.<br>• Removing the aggregate from the oven, cooling to room temperature in the air tight desiccators and let the weight be "D"<br>• Repeating the entire procedure for second sample also.<br>**(b) Test on Bulking of sand**<br>• Placing of sand in cylindrical container.<br>• Measuring water using graduated glass jar.<br>• Measuring Initial volume, Final volume of sand and volume of water.<br>• Uniform mixing of water and sand.<br>• Transferring the mixed sand from pan into measuring jar carefully. |

| | |
|---|---|
| | • Converting percentage of water into volume of water.<br>• Calculating accurately the % of bulking for every equal increment of water added.<br>• Drawing ordinary Graph with % of water added on X-axis and % of bulking on Y-axis.<br>• Recording maximum percentage of bulking of sand corresponding to the percentage of water added from the curve of the Graph, record.<br>• Calculating the volume of sand required taking into consideration the bulkage.<br>**(c) Test on determination of bulk density and percentage of voids in Coarse and Fine aggregate**<br>• Using of balance and recording weight.<br>• Measuring the volumes of fine and coarse aggregate using cylindrical metal measure in loose and compacted states.<br>• Weighing of cylindrical metal measures.<br>• Weighing of cylindrical metal measures.<br>• Tamping the aggregate in 25 strokes with tamping rod.<br>• Calculating of bulk density of coarse and fine aggregates both in loose and completed states.<br>**(d) Sieve analysis of coarse and fine aggregates**<br>• Using of balance to weigh coarse and fine aggregates and recording their weight.<br>• Arranging the set of sieves used for sieve analysis of coarse aggregate.<br>• Arranging the set of sieves used for sieve analysis of fine aggregate.<br>• Sieving of coarse and fine aggregate on a machine or sieve shaker<br>• Calculating the cumulative percentage weight retained for coarse and fine aggregate.<br>• Calculating the fineness modulus of coarse and fine aggregates.<br>**(e) Field method to determine fine silt in aggregate**<br>• Measuring the sand by graduated cylinder/jar.<br>• Measuring the amount of fines forming a separate layer.<br>• Adding of correct quantity of water to sand.<br>• Calculating the silt content. |

| | |
|---|---|
| | **4.0 Tests on metals**<br>**(a) Tension test on mild steel rod**<br>• Mounting the specimen in the grips of movable and fixed heads of UTM.<br>• Adjusting the load points to zero, after jaws hold the specimen firmly.<br>• Keeping left valve in open position and right valve closed position.<br>• Switch off the instrument. Measuring the diameter of the rod.<br>• Making specimen of convenient length.<br>• Applying the load slowly and gradually.<br>• Removing the specimen from the grips.<br>• Marking the center point<br>• Measuring the gauge length.<br>• Keeping the left valve in closed position after completion of the experiment<br>• Observing the load decreasing and neck formation.<br>• Noting the yield point, ultimate load and breaking point.<br>• Plot the stress and strain graph<br>**(b) Hardness test on metals**<br>• Keeping the specimen ready for testing<br>• Setting of dial to zero<br>• Identifying Ball and diamond indenters<br>• Identifying A, B, and C scale<br>• Applying minor load<br>• Reading of hardness number using microscope<br>**(c) Izod/Charpy Impact test on metals**<br>• Preparing the standard specimen and fixing the specimen in the position of anvil.<br>• Clutching the striking hammer.<br>• Adjusting the pointer.<br>• Fixing the specimen in the position of anvil.<br>• Adjusting the pointer.<br>• Releasing pendulum to strike the specimen by taking safety precaution<br>• Preparing the standard specimen<br>• Recording down the reading by observing the appropriate scale |

| | |
|---|---|
| | **(d) Deflection test on beam**<br>• Operating UTM.<br>• Fixing and reading of dial gauge<br>• Placing of specimen over the brackets centrally.<br>• Selection of load range for the test.<br>• Adjusting the load gauge and deflectometer to zero.<br>• Applying of load at the rate of 2.5 mm per minute.<br>• Noting down the deflection for each increment of load.<br>• Drawing of graph between load vs deflection<br>• Calculating of Young's modulus from the graph |

**PO-CO Mapping:**

| **Course Code : C-309** | **Course Title: Material Testing Practice** | **Number of Course Outcomes: 05** | | | **No. of Periods: 45** |
|---|---|---|---|---|---|
| **POs** | **Mapped with CO No.** | **CO Periods addressing PO in Column 1** | | **Level (1,2,3)** | **Remarks** |
| | | **No** | **%** | | |
| PO1 | CO1, CO3, CO4 | 13 | 29 | 2 | > 40% Level 3 |
| PO2 | CO1,CO3, CO4 | 12 | 27 | 2 | Highly addressed |
| PO3 | CO1, CO3, CO4 | 12 | 27 | 2 | 25% to 40% Level 2 |
| PO4 | CO2 | 4 | 8.5 | 1 | Moderately addressed |
| PO5 | CO5 | 4 | 8.5 | 1 | 5 to 25% Level 1 |
| PO6 | | | | | Low addressed |
| PO7 | | | | | < 5% Not addressed |

**CO-PO Mapping:**

| **CO No.** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PSO1** | **PSO2** | **PSO3** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | 2 | | | | | 2 | 3 | 3 |
| **CO2** | | | | 3 | | | | 2 | 3 | 2 |
| **CO3** | 2 | 3 | 2 | | | | | 2 | 3 | 2 |
| **CO4** | 2 | 3 | 3 | | | | | 2 | 3 | 2 |
| **CO5** | | | | | 2 | | | 2 | 3 | 3 |
| **Average** | 2 | 2.7 | 2.3 | 3 | 2 | | | 2 | 3 | 2.4 |

**Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**

**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc**

## KEY Competencies to be achieved by the student

| S.No | Experiment Title | Competency | Key Competency |
|---|---|---|---|
| 1 | Water Absorption on bricks | Taking weight of dry bricks and wet bricks | |
| 2 | Crushing strength test on bricks | 1. Preparation of 1:1 cement mortar and application cement mortar over top and bottom faces of brick<br>2. Application of load gradually at the rate 14 $N/mm^2$ per minute till failure a occurs<br>3. Recording the load at FAILURE | Preparation of 1:1 cement mortar<br>Application of load gradually at the rate 14 $N/mm^2$ per minute till failure a occurs |
| 3 | Fineness test on cement | Taking weight of cement sample and its residue | |
| 4 | Normal consistency test on cement | 1. Measurement of required percentage of water to cement accurately<br>2. Preparation of sample in the mould<br>3. Reading of Vicat's scale/noting down the plunger penetration | Preparation of sample in the mould<br>Reading of Vicat's scale/noting down the plunger penetration |
| 5 | Setting times of cement | 1. Measurement of required percentage of water to cement accurately<br>2. Preparation of sample in the mould<br>3. Reading of Vicat's scale/noting down the needle penetration<br>4. Recording time at required needle penetration | Preparation of sample in the mould<br>Reading of Vicat's scale/noting down the needle penetration |
| 6 | Compressive strength test on cement | 1. Taking weights of different grades of standard sand and cement accurately | Application of load at required rate and recording of load at failure accurately |

| | | | |
|---|---|---|---|
| | | 2. Addition of required percentage of water to cement accurately | |
| | | 3. Application of load at required rate and recording of load at failure accurately | |
| 7 | Water absorption of sand | Accurate weighing of dry sand and wet sand | |
| 8 | Bulking of sand | 1. Measuring of sand and water accurately | Measuring of increasing in volume of sand |
| | | 2. Addition of water to sand in accurate increments | |
| | | 3. Measuring of increasing in volume of sand | |
| 9 | Determination of necessary adjustment for bulking of fine aggregate by field method | Measurement of volume of sand accurately | -- |
| 10 | Bulk density and Percentage of voids in coarse and fine aggregates | 1. Taking of weight of cylindrical metal measure accurately | Taking weight of aggregate and containers |
| | | 2. Calculating of bulk density of coarse and fine aggregates both in loose and compacted states | |
| | | 3. Taking weight of aggregate and containers | |
| 11 | Sieve analysis of coarse and fine aggregate | 1. Correct arrangement of sieves used for the sieve analysis of fine or coarse aggregate | Correct arrangement of sieves used for the sieve analysis of fine or coarse aggregate |
| | | 2. Weighing of residue in each sieve accurately | |
| 12 | Field method of determining fine silt in aggregate | 1. Measuring sand by graduated cylinder accurately | -- |
| | | 2. Measuring correct quantity of water to be added to sand | |
| 13 | Tension test on mild | 1. Marking of gauge length on | |

| | | | |
|---|---|---|---|
| | steel rod | the MS Rod | Fixing the specimen correctly in between jaws<br>Application of load at required rate carefully |
| | | 2. Fixing the specimen correctly in between jaws | |
| | | 3. Application of load at required rate carefully | |
| | | 4. Measuring the load at failure accurately | |
| 14 | Torsion test on mild steel rod | 1. Measurement of length and diameter of specimen accurately | Application of load accurately<br>Measuring the angle of rotation accurately |
| | | 2. Application of load accurately | |
| | | 3. Measuring the angle of rotation accurately | |
| 15 | Brinell/Rockwell | 1. Placing of specimen at exact position | -- |
| | | 2. Application and release of load at required rate | |
| 16 | Izod/Charpy test on mild steel/brass | 1. Preparation of standard specimen and fixing the specimen in the right position of anvil | Preparation of standard specimen and fixing the specimen in the right position of anvil |
| | | 2. Recording down the reading by observing the appropriate scale | |
| 17 | Deflection test on beams | 1. Measuring the dimensions of specimen accurately | Measurement of deflection accurately |
| | | 2. Application of load at exact point of application | |
| | | 3. Measurement of deflection accurately | |
| | | 4.Measurement of deflection of springs | |

## COURSE CONTENT

**1. Tests on Bricks**

Water absorption - Crushing strength

**2. Tests on Cement**

Fineness test - Normal consistency test - Setting times of cement - Compressive strength of cement.

**3. Tests on Aggregates**

Water absorption of Sand - Bulking of Sand - To determine necessary adjustment for bulking of fine aggregate by Field method - Bulk density and Percentage of voids in Coarse and fine aggregates - Sieve analysis of coarse and fine aggregates - Field method to determine fine silt in aggregate.

**4. Tests on Metals**

Tension test on mild steel rod - Torsion test on mild steel rod - Brinell/Rockwel hardness test on steel and Brass with different surface finish - Izod/Charpy tests on mild steel/brass - Deflection Test on beam (Steel beam or wooden beam)

## REFERENCE BOOKS:

1. Laboratory manual of strength of materials and soil mechanics, SBTET, A.P.

# HYDRAULICS PRACTICE

| Course Code | Course Title | No. of Periods per Week | Total No. of Periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-310 | Hydraulics Practice | 03 | 45 | 40 | 60 |

| S.No | Major Topics | No. of Periods | COs Mapped |
|---|---|---|---|
| 1 | Determination of Hydraulic Coefficients / factors / Constants / Verification of Principles / Laws | 36 | CO1, CO2, CO3, CO4 |
| 2 | Study on Hydraulic Machines | 09 | CO5 |
| | **Total** | **45** | |

**COURSE OBJECTIVES:**

| **Upon completion of the Course, the student shall be able to** | | |
|---|---|---|
| **Course Objectives** | 1 | Understand the principles of Hydraulics in flow measurements and Pumps & Turbines. |
| | 2 | Critically observe/examine and Measure the discharges through flow measuring devices. |
| | 3 | To know the etiquette of working with the fellow work force. |
| | 4 | To reinforce theoretical concepts by conducting relevant experiments/exercises. |

**COURSE OUTCOMES:**

| | | | |
|---|---|---|---|
| **Course Outcomes** | CO1 | C-310.1 | Conduct Experiment to determine Hydraulic Coefficients of Orifices, Mouthpieces and notches. |
| | CO2 | C-310.2 | Conduct a test employing Bernoulli's theorem (i) to observe head variation (ii) To determine discharges by varying the head. |
| | CO3 | C-310.3 | Conduct Experiment to determine flow rates, pressure changes, and major head loss for flow through pipes. |
| | CO4 | C-310.4 | Conduct open channel flow to measure chezy's constant. |
| | CO5 | C-310.5 | Conduct relevant test to evaluate the performance of Hydraulic machines |

**LEARNING OUTCOMES:**

| | |
|---|---|
| **LEARNING OUTCOMES** | **1.1 Determine coefficient of discharge of a small orifice by constant head method and variable head method.**<br>• Measure dimensions of collecting tank using meter scale and record its dimensions.<br>• Measure the diameter of Orifice using Vernier calipers.<br>• Priming of motor is to be done before switching on.<br>• Operate outlet valve of collecting tank for taking T & H for calculation of Qa, without overflowing it.<br>• Measure the time required (T) to rise the water level to a desired height (H) after closing outlet valve in the colleting tank.<br>• Maintain constant head in supply tank.<br>• Preparation of graph with the observed values and adding a trend line, measuring slope of it and finding out the Cd from graph.<br><br>**1.2Determine coefficient of discharge of a small orifice by variable head method.**<br><br>• Measure the diameter of Orifice Using Vernier calipers<br>• Priming of motor is to be done before switching on<br>• Measure dimensions of orifice tank<br>• Measure the diameter of Orifice using Vernier calipers<br>• Switch on the Pump (If pump is not working, go for Priming)<br>• Record the time taken to descend the water level in the orifice tank from head $H_1$to head $H_2$.<br><br>**1.3 Determine the hydraulic coefficients of an orifice.**<br><br>• Switching on the motor after priming<br>• Operation of different valves<br>• Measure diameter of Orifice Using Vernier callipers<br>• Measure the internal dimensions of the tank.<br>• Operation of stop watch<br>• Operation of sliding Vernier scale<br>• Reading a piezometer values without parallax by maintaining the constant head<br>• Note the time for collecting specified quantity of water and subsequent valve operations.<br>• Reading on piezometer has to be taken corresponding to lower meniscus level.<br>• Identify the location of Vena-Contracta.<br>• Note down the Initial co-ordinates taken at vena-contracta and final co-ordinates taken at any random point on jet |

| | |
|---|---|
| | **1.4 Determine coefficient of discharge of a mouthpiece by constant head method.**<br>• Use meter scale to measure dimensions of collecting tank and recording its dimensions.<br>• Use vernier calipers to know the diameter of mouthpiece<br>• Note the time elapsed for collecting specified quantity of water using stop watch.<br>• Operate outlet valve to know the rise of water in collecting tank.<br>• Operate inlet valve to maintain constant head<br>• Measure time required to constant rise in collecting tank after Closing outlet valve.<br>• Record values accurately.<br>• Calculate $C_d$ for mouth piece.<br>• Plot the graph with specific parameters.<br>• Compare graph with standard values.<br><br>**1.5 Determine coefficient of discharge of a rectangular notch.**<br>• Measure the size of Notch and collecting tank<br>• Fix hook gauge with sharp edge needle in Notch tank.<br>• Note the least count of point gauge<br>• Allow the water into notch tank up to crest level of notch and record the point gauge reading.<br>• Control Valves to regulate the flow of water to maintain constant depth over crest of notch.<br>• Measure the head over Notch.<br>• Measure the depth of flow.<br>• Note the time using the stop watch for 10cm rise of water in collecting tank.<br>• Note the Readings of Piezometer at collecting tank without parallax error.<br><br>**1.6 Determine coefficient of discharge of a triangular notch.**<br>• Measure the size of Notch and collecting tank<br>• Fix hook gauge with sharp edge needle in Notch tank.<br>• Note the least count of point gauge<br>• Allow the water into notch tank up to crest level of notch and record the point gauge reading.<br>• Control Valves to regulate the flow of water to maintain constant depth over crest of notch<br>• Measure the head over Notch.<br>• Measure the depth of flow.<br>• Note the time using the stop watch for 10cm rise of water in collecting tank.<br>• Note the Readings of Piezometer at collecting tank without parallax error. |

| | |
|---|---|
| | **1.7 Verify Bernoulli's theorem.**<br>• Priming operation is to be done before switching on the motor.<br>• Stop watch reading.<br>• Maintain constant head by operating appropriate valves.<br>• Measurement of areas and piezometer reading at given sections without parallax.<br>• Measure the dimensions of collecting tank.<br>• Note down the time taken for 10 cm rise in collecting tank without parallax.<br>• Calculate actual discharge.<br>• Calculate velocity and velocity heads at various sections of piezometers.<br>• Calculate and verify total heads at various sections.<br>**1.8 Determine coefficient of discharge of a venturimeter.**<br>• Operate the control valve for varying flow rate.<br>• Check condition of valves for manometer, collecting tank,<br>• venturimeter conduit or pipe.<br>• Check for working of stop watch and Pump (If pump is not working go for Priming)<br>• Release air bubbles in U tube manometer by using respective valves.<br>• Release valves of collecting tank, noting the time taken for specific rise in water level in it.<br>• Adjust control valve for required flow rate<br>• Record readings of u tube manometer.<br>• Calculate Cd of venturi meter.<br><br>**1.9 Determine friction factor in pipe flow.**<br>• Use Vernier callipers to determine diameter of the pipe.<br>• Perform Priming of Centrifugal Pump.<br>• Identify the points in the pipe to know the Pressure difference.<br>• Regulate the flow in pipe to avoid air bubbles.<br>• Operate Inlet Valve to Maintain Constant Head.<br>• Operate Control valves for Reservoir and collecting tank.<br>• Operate Control valves for Creating Pressure Difference between two points.<br>• Take Differential Manometer reading.<br>• Allow water to a measurement of 100mm rise in collecting tank.<br>• Note the time elapsed for 100mm rise by stop watch in sec.<br><br>**1.10 Determine Chezy's constant in open channel flow.**<br>• Before starting the motor, priming should be done is necessary.<br>• Operating valves to maintain steady flow.<br>• Taking the water level reading using the gauge.<br>• Read the piezometer reading without parallax error.<br>• Stop watch operation.<br>• Care should be taken to avoid overflow of the collecting tank. |

| | |
|---|---|
| | • Note down the slope of the channel.<br>• Maintain steady flow.<br>• Note the time taken for 10cm rise in the collecting tank<br>• Head should be read carefully on the point gauge.<br>• Calculate the values of chezy's constant for different discharges.<br><br>**2.0 Tests on Hydraulic machines.**<br><br>**2.1 Conduct performance test on a single stage Centrifugal pump**<br>• State the Aim / apparatus /equipment required<br>• Perform test and record observations<br>• Identify the component parts of a reciprocating pump.<br>• State the functions of each component.<br>• State field applications.<br><br>**2.2 Determine the efficiency of a Reciprocating pump**<br>• State the Aim/apparatus/equipment required.<br>• Perform test and record observations.<br>• Identify the component parts of a reciprocating pump.<br>• State the functions of each component.<br>• State field applications and compare with Reciprocating pump.<br><br>**2.3 Study on Hydraulic Turbines**<br>• Identify the component parts of Pelton wheel, Francis or kaplan turbines.<br>• State function of each component.<br>• State field applications. |

**PO-CO Mapping:**

| Course Code: C-310 | Course Title: HYDRAULICS PRACTICE<br>No of COs : 5 | | | | No. of Periods: 45 |
|---|---|---|---|---|---|
| POs | Mapped with CO No. | CO Periods addressing PO in Column 1 | | Level (1,2,3) | Remarks |
| | | No | % | | |
| PO1 | CO1, CO2, CO3, CO4, CO5 | 10 | 22 | 1 | > 40% Level 3 Highly addressed<br>25% to 40% Level 2 Moderately addressed<br>5 to 25% Level 1 Low addressed<br>< 5% Not addressed |
| PO2 | CO1, CO2, CO3, CO4, CO5 | 12 | 27 | 2 | |
| PO3 | CO1, CO2, CO3, CO4, CO5 | 7 | 15 | 1 | |
| PO4 | CO1, CO2, CO3 | 4 | 9 | 1 | |
| PO5 | | | | | |
| PO6 | CO1, CO2, CO3, CO4, CO5 | 12 | 27 | 2 | |
| PO7 | | | | | |

**CO-PO Mapping:**

| CO No. | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 2 | | 3 | | 1 | 3 | 2 |
| **CO2** | 3 | 3 | 2 | 2 | | 3 | | 1 | 3 | 2 |
| **CO3** | 3 | 3 | 2 | 2 | | 3 | | 1 | 3 | 2 |
| **CO4** | 3 | 3 | 2 | | | 3 | | 1 | 3 | 2 |
| **CO5** | 3 | 3 | 2 | | | 3 | | 1 | 3 | 2 |
| **Average** | 3.0 | 3.0 | 2.0 | 2.0 | | 3.0 | | 1 | 3 | 2 |

**Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**

**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc**

**COURSE CONTENT:**

**LIST OF EXPERIMENTS**

**I Determination of Hydraulic Coefficients/factors/Constant/Verification of Principles/ Laws**

a. Determination of coefficient of discharge of a small orifice by constant head method
b. Determination of coefficient of discharge of a small orifice by variable head Method
c. Determination of Cc of an orifice by finding $C_v$ and $C_d$.
d. Determination of coefficient of discharge of a mouthpiece by constant Head method.
e. Determination of coefficient of discharge of a triangular notch.
f. Determination of coefficient of discharge of a rectangular notch.
g. Determination of coefficient of discharge of a trapezoidal notch.
h. Verification of Bernoulli's theorem.
i. Determination of coefficient of a discharge of a venture meter.
j. Determination of friction factor in pipe flow.
k. Determination of Chezy's constant in open channel flow.

**II Study of Fluid machines**

a. Tests on reciprocating pump and centrifugal pump.
b. Study on turbines – Pelton / Francis / Kaplan.

**KEY Competencies to be achieved by the student**

| S. No | Experiment Title | Competency | Key Competency |
|---|---|---|---|
| 1 | Coefficient of discharge of small orifice by constant head. | 1)Regulate the flow<br>2)Operate stop clock accurately<br>3)Draw graph between Q vs $H^{1/2}$ | 1)Regulate the flow<br>2)Operate stop clock accurately<br>3)Draw graph between Q vs $H^{1/2}$ |
| 2. | Coefficient of discharge of small orifice by variable head | 1)Note readings of head at intervals.<br>2)Operate stop clock accurately<br>3)Draw graph between Q vs $H^{1/2}$ | |
| 3 | Hydraulic coefficients of orifice. | 1)Regulate flow.<br>2)Note co-ordinate values and measure volume<br>3) Operate stop clock accurately<br>4)State the relation. | |
| 4. | Coefficient of discharge of mouth piece by constant head. | 1)Regulate the flow<br>2)Operate stop clock accurately<br>3)graph between Q vs $H^{1/2}$ | |
| 5. | Coefficient of discharge of rectangular notch. | 1)Note readings of head<br>2)Operate stop clock accurately<br>3)Draw graph between Q vs $H^{3/2}$ | 1)Regulate the flow<br>2)Operate stop clock accurately |
| 6. | Coefficient of discharge of triangular notch | 1)Note readings of head<br>2)Operate stop clock accurately<br>3)Draw graph between Q vs $H^{5/2}$ | 1)Regulate the flow<br>2)Operate stop clock accurately |

| | | | |
|---|---|---|---|
| 7 | Verify Bernoulli's theorem | 1)Note readings of head at various locations<br>2)Plot hydraulic gradient line and total energy line | Plot hydraulic gradient line and total energy line |
| 8 | Coefficient of discharge of venturimeter. | 1)Note readings of head<br>2)Operate stop clock accurately<br>3)Draw graph between Q vs $H^{1/2}$ | 1)Regulate the flow<br>2)Operate stop clock accurately |
| 9 | Friction factor in pipe flow. | 1)Note readings of head<br>2)Observe the significance of friction factor of pipe flow. | Observe the significance of friction factor of pipe flow |
| 10 | Chezy's constant | 1)Note readings of head<br>2)Observe the significance in design of section of open channel | Observe the significance in design of section of open channel |

# IV SEMESTER

**DIPLOMA IN CIVIL ENGINEERING**
**SCHEME OF INSTRUCTION AND MODEL BLUE PRINT FOR EVALUATION**
**CURRICULUM-2020**
**FOURTH SEMESTER**

| Sub Code | Name of the Subject | Instruction Periods/Week | | Total Periods Per Year | Scheme Of Examination | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | | Duration (hrs) | Sessional Marks | End Exam Marks | Total Marks |
| **THEORY** | | | | | | | | |
| **C-401** | Engineering Mathematics-III | 3 | | 45 | 3 | 20 | 80 | 100 |
| **C-402** | Design and Detailing of R.C.Structures | 5 | | 75 | 3 | 20 | 80 | 100 |
| **C-403** | Quantity Surveying-I | 5 | | 75 | 3 | 20 | 80 | 100 |
| **C-404** | Transportation Engineering | 5 | | 75 | 3 | 20 | 80 | 100 |
| **C-405** | Irrigation Engineering | 4 | | 60 | 3 | 20 | 80 | 100 |
| **PRACTICAL** | | | | | | | | |
| **C-406** | Civil Engineering Drawing-II | | 6 | 90 | 3 | 40 | 60 | 100 |
| **C-407** | Concrete & Soil Testing Practice | | 4 | 60 | 3 | 40 | 60 | 100 |
| **C-408** | Communication Skills | | 3 | 45 | 3 | 40 | 60 | 100 |
| **C-409** | Surveying-III Practice | | 3 | 45 | 3 | 40 | 60 | 100 |
| **C-410** | CAD Practice-I | | 4 | 60 | 3 | 40 | 60 | 100 |
| | **Total** | **22** | **20** | **630** | | **300** | **700** | **1000** |

**C-20**

**ENGINEERING MATHEMATICS-III**

| Course Code | Course Title | No. of Periods/week | Total No. of periods | Marks for FA | Marks for SA |
|---|---|---|---|---|---|
| C-401 | Engineering Mathematics-III | 3 | 45 | 20 | 80 |

| S.No. | Unit Title | No. of periods | COs mapped |
|---|---|---|---|
| 1 | Higher order Linear Differential equations with constant coefficients | 15 | CO1 |
| 2 | Laplace Transforms | 18 | CO2 |
| 3 | Fourier Series | 12 | CO3 |
| | **Total Periods** | **45** | |

| | |
|---|---|
| **Course Objectives** | (i) To learn the principles of solving differential equations of second and higher order.<br>(ii) To comprehend the concept of Laplace transformations and inverse Laplace transformations.<br>(iii) To understand the concept of Fourier Series expansion of functions. |

| | | |
|---|---|---|
| **Course Outcomes** | CO1 | Solve homogeneous and non-homogeneous differential equations of second and higher order. |
| | CO2 | Find Laplace and inverse Laplace transforms of various functions. |
| | CO3 | Expand given functions as Fourier series and half- range Fourier Sine and Cosine series. |

## ENGINEERING MATHEMATICS – III

### Learning Outcomes

#### Unit-I

#### Differential Equations of higher order

**C.O. 1 Solve homogeneous and non-homogeneous differential equation of second and higher order.**

**L.O** 1.1 Solve Differential equations of the type $(aD^2 + bD + c)\, y = 0$ where a, b, c are real numbers and provide examples.

1.2 Solve higher order homogeneous differential equations with constant coefficients and provide examples.

1.3 Define complementary function, particular Integral and general solution of a non-homogeneous differential equation.

1.4 Describe the methods of solving *f(D) y = X* where *f(D)* is a polynomial of $n^{th}$ order and *X* is a function of the forms $k,\ e^{ax},\ \sin ax, \cos ax,\ x, x^n$ and their linear combinations where n is a positive integer, with examples.

#### Unit-II

#### Laplace Transforms

**C.O. 2 Find Laplace and inverse Laplace transforms of various functions.**

**L.O.** 2.1 Define Laplace Transform and explain the sufficient conditions of existence of Laplace Transform

2.2. Obtain Laplace transforms of standard functions and solve simple problems.

2.3 Write the properties of Laplace Transform – Linearity property, First shifting theorem (without proof) and Change of Scale property and solve simple problems.

2.4. Write the Laplace Transform of unit step function and second shifting theorem (without proof) and solve simple problems.

2.5. Write formulae for Laplace transform of functions with multiplication by $t^n$ and division by t, Laplace transform of derivatives, evaluation of some definite integrals using Laplace Transforms and solve simple problems.

Syllabus for Unit test-I completed

2.6 Define inverse Laplace Transform, obtain inverse Laplace Transforms of standard functions and solve simple problems.

2.7 Write linearity property, first and second shifting theorems (without proof), change of scale property of inverse Laplace transform and solve simple problems.

2.8 Write inverse Laplace transforms of derivatives and integrals and solve simple problems.

2.9 Write inverse Laplace transforms of functions with multiplication by s and division by s and solve simple problems.

2.10 Write inverse Laplace transforms of functions using partial fractions and solve some simple problems.

2.10 Define convolution of two functions, state convolution theorem (without proof) and solve simple problems.

**Unit-III**

**Fourier series**

**C.O. 3 Expand given functions as Fourier series and half- range Fourier Sine and Cosine series**

**L.O**. 3.1 Define the orthogonality of functions in an interval.

3.2 Define Fourier series of a function in the intervals $(c,\ c+2\pi)$ and $(c,\ c+2l)$ and write the Euler's formulae for determining the Fourier coefficients.

3.3 Write sufficient conditions for the existence of Fourier series expansion of a function.

3.4 Find Fourier series of simple functions in the range (0 , 2π) and (-π , π)

3.5 Write Fourier series for even and odd functions in the interval $(-\pi,\ \pi)$ and $(-l, l)$ expand simple functions.

3.6 Write Fourier series expansion of a function over the interval (0, 2l) and $(-l,\ l)$ and expand simple functions.

3.7 Write half-range Fourier sine and cosine series of a function over the interval (0, π) and $(0,\ l)$ and expand simple functions.

Syllabus for Unit test-II completed

**Engineering Mathematics – III**

**CO/PO - Mapping**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PSO1** | **PSO2** | **PSO3** |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 1 | | | | 2 | 3 | 2 |
| CO2 | 3 | 3 | 3 | 3 | | | | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | | | | 3 | 3 | 3 |
| Avg | 3 | 2.66 | 2.33 | 2.33 | | | | 2.66 | 3 | 2.66 |

**3 =** Strongly mapped (High), **2 =** Moderately mapped (Medium), **1 =** Slightly mapped (Low)

**Note**:

**PO5:** Appropriate quiz programme may be conducted at intervals and duration as decided by concerned teacher.

**PO6:** Seminars on applications of mathematics in various engineering disciplines are to be planned and conducted.

**PO7:** Such activities are to be planned that students visit library to refer standard books on Mathematics and latest updates in reputed national and international journals, attending seminars, learning mathematical software tools.

**PSO1:** An ability to understand the concepts of basic mathematical concepts and to apply them in various areas like computer programming, civil constructions, fluid dynamics, electrical and electronic systems and all concerned engineering disciplines.
**PSO2:** An ability to solve the Engineering problems using latest software tool, along with analytical skills to arrive at faster and appropriate solutions.
**PSO3:** Wisdom of social and environmental awareness along with ethical responsibility to have a successful career as an engineer and to sustain passion and zeal for real world technological applications.

## C-20
## Engineering Mathematics – III
### PO- CO – Mapping strength

| PO no | Mapped with CO no | CO periods addressing PO in column I | | Level (1,2 or 3) | Remarks |
|---|---|---|---|---|---|
| | | No | % | | |
| 1 | CO1, CO2, CO3 | 45 | 100% | 3 | |
| 2 | CO1, CO2, CO3 | 37 | 82.2% | 3 | >40% Level 3 |
| 3 | CO1, CO2, CO3 | 32 | 71.1% | 3 | Highly addressed |
| 4 | CO1, CO2, CO3 | 32 | 71.1% | 3 | |
| 5 | | | | | 25% to 40% |
| 6 | | | | | Level 2 |
| 7 | | | | | Moderately addressed |
| PSO 1 | CO1, CO2, CO3 | 37 | 82.2% | 3 | |
| PSO 2 | CO1, CO2, CO3 | 45 | 100% | 3 | 5% to 25% |
| PSO 3 | CO1, CO2, CO3 | 36 | 80% | 3 | Level 1 Low addressed |
| | | | | | <5% Not addressed |

**ENGINEERING MATHEMATICS – III**

**(Common Subject)**

**Course Content**

**Unit I: Differential Equations of higher order**

1. Solve Homogenous linear differential equations with constant coefficients of order two and higher with emphasis on second order.
2. Solve Non-homogenous linear differential equations with constant coefficients of the form f(D)y = X where X is in the form k(constant), $e^{ax}$, sinax, cosax, $x^n$, where n is a positive integer, finding complimentary function, particular integral and general solution.

**Unit II: Laplace Transforms**

3. Definition, sufficient conditions for existence of LT, LT of elementary functions, linearity property, state first shifting theorem, change of scale property, multiplication by $t^n$, division by t, LT of derivatives and integrals, LT of unit step function, state second shifting theorem, inverse Laplace transforms- state shifting theorems and change of scale property, multiplication by $s^n$ and division by s, derivatives, integrals, examples of inverse LT using partial fractions, state convolution theorem with simple examples.

**Unit III: Fourier series**

4. Orthogonality of trigonometric functions, Representation of a function in Fourier series over the interval $(c\ ,\ c+2\pi)$ and $(c\ ,\ c+2l)$, Euler's formulae , sufficient conditions for existence of Fourier series expansion of a function, Fourier series expansion of basic functions limited to k(constant), $x, x^2, \sin ax, \cos ax, e^{ax}$ and their combinations over the intervals $(0,\ 2\pi),(-\pi,\pi),(0,\ 2l),(-l,l)$ , Fourier series for even and odd functions over $(-\pi,\pi)\text{and}(-l,l)$, Fourier half-range sine and cosine series over $(0,\ \pi)$ and $(0,\ l)$

## Textbook:

Engineering Mathematics-I, a textbook for first year diploma courses, prepared & prescribed by SBTET, AP.

**Reference Books:**


1. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers
2. M.R. Spiegel, Schaum's Outline of Laplace Transforms, Schaums' Series
3. M.Vygodsky, Mathematical Handbook: Higher Mathematics, Mir Publishers, Moscow.

**Blue print**

| S. No | Chapter/ Unit title | No of Periods | Weightage allotted | Marks wise distribution of weightage | | | | Question wise distribution of weightage | | | | COs mapped |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | R | U | Ap | An | R | U | Ap | An | |
| **1** | Unit – I Higher order Linear Differential equations with constant coefficients | 15 | 28 | 11 | 11 | 3 | 3 | 2 | 2 | 1 | 1 | CO1 |
| **2** | Unit - II Laplace Transforms | 18 | 33 | 11 | 11 | 11 | 0 | 2 | 2 | 2 | 0 | CO2 |
| **3** | Unit - III Fourier Series | 12 | 19 | 3 | 3 | 3 | 10 | 1 | 1 | 1 | 1 | CO3 |
| **Total** | | **45** | **80** | **25** | **25** | **17** | **13** | **5** | **5** | **4** | **2** | |

**R: Remembering Type : 25 Marks**
**U: understanding Type : 25 Marks**
**Ap: Application Type : 17 Marks**
**An: Analysing Type : 13 Marks**

**C-20**
**Engineering Mathematics – III**
**Unit Test Syllabus**

| Unit Test | Learning Outcomes to be Covered |
|---|---|
| **Unit Test-I** | From LO 1.1 to 2.5 |
| **Unit Test-II** | From LO 2.6 to 3.7 |

**Unit Test I** **C –20, C-401**

**State Board of Technical Education and Training, A. P**

**First Year**

**Subject name: Engineering Mathematics-II**

**Sub Code: C-401**

**Time : 90 minutes** **Max.Marks:40**

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**Part-A** **16Marks**

***Instructions:*** **(1) Answer all questions.**

**(2) First question carries four marks and the remaining questions carry three marks each**

1. Answer the following:

   a. Write the auxiliary equation for given differential equation $\left(D^2+4\right)y=0$ (CO1)

   b. For given differential equation $f(D)y=0$ , if roots of auxiliary equation are 1,-1,then $y=$ _____ (CO1)

   c. $L\left\{e^{3t}\right\}=$ _____ (CO2)

   d. $L\{f(t)\}=\overline{f}(s)$ then $L\left\{e^{at}f(t)\right\}=\overline{f}(s+a)$ : State TRUE/FALSE (CO2)

2. Solve $\left(D^2-2D+1\right)y=0.$ (CO1)

3. Find the particular integral of $\left(D^2+D+4\right)y=e^x$ ( CO1)

4. Evaluate $L\left\{\left(t-1\right)^2\right\}$ (CO2)

5. Evaluate $L\left\{t^2+2\cos t+3\sin t\right\}$ (CO2)

**Part-B** **3×8=24**

***Instructions:*** **(1) Answer all questions.**

**(2) Each question carries eight marks**

**(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. A) Solve $\left(D^4-5D^2+4\right)y=0.$ (CO1)

   or

   B) Solve $\left(D^2+D-6\right)y=1+e^{-3x}.$ (CO1)

7. A) Solve $\left(D^2+3D+2\right)y=x^2+\sin x.$ (CO1)

or

B) Solve $\left(D^2-D\right)y=2e^x+3\cos x.$ (CO1)

8. A) Evaluate $L\left\{e^{3t}\cos^2 t\right\}$ (CO2)

or

B) Evaluate $L\left\{e^t\left(t+1\right)^2\right\}$ (CO2)

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**Unit Test II** **C –20, C-401**

**State Board of Technical Education and Training, A. P**

**First Year**

**Subject name: Engineering Mathematics-II**

**Sub Code: C-401**

**Time : 90 minutes** **Max.Marks:40**

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**Part-A** **16Marks**

***Instructions:*** (1) Answer **all** questions.

(2) First question carries **four** marks and the remaining questions carry **three** marks each

1. Answer the following:

   a. $L\{f(t)\} = \overline{f}(s)$ then $L\{tf(t)\} = -\frac{d}{ds}\left(\overline{f}(s)\right)$: State TRUE/FALSE (CO2)

   b. $L^{-1}\left\{\frac{1}{s-3}\right\} = ?$

   (CO2)

   c. $L^{-1}\left\{\frac{1}{s^2+a^2}\right\} = ?$ (CO2)

   d. Write the Fourier series for the function $f(x)$ in the interval $c < x < c+2\pi.$ (CO3)

2. Evaluate $L\left\{te^t\right\}.$ (CO2)

3. Evaluate $\int_0^\infty e^{-3t}\sin 4t dt.$ (CO2)

4. Evaluate $L^{-1}\left\{\frac{3}{s+4}+\frac{2}{s^2+16}-\frac{s}{s^2-4}\right\}.$ (CO2)

5. Evaluate Fourier coefficient $a_0$ for $f(x)$ in the interval $(-\pi,\pi).$ (CO3)

**Part-B** **3×8=24**

***Instructions:*** **(1) Answer all questions.**
**(2) Each question carries eight marks**
**(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. A) Evaluate $L\left\{te^{-t}\cos t\right\}$. (CO2)

or

B) Evaluate $L\left\{\frac{\cos at-\cos bt}{t}\right\}$. (CO2)

7. A) Evaluate $L^{-1}\left\{\frac{s}{(s+1)(s^2+1)}\right\}$. (CO2)

or

B) Evaluate $L^{-1}\left\{\frac{s}{(s-1)^4}\right\}$. (CO2)

8. A) Obtain the Fourier series for the function $f(x)=e^x$ in the interval $(0,2\pi)$. (CO3)

or

B) Obtain the half range Fourier cosine series of $f(x)=x^2$ in $(0,1)$. (CO3)

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**END EXAM MODEL PAPER**
**STATE BOARD OF TECHNICAL EDUCATION, A.P**
**ENGINEERING MATHEMATICS –C- 401**

**TIME : 3 HOURS** **MODEL PAPER- I** **MAX.MARKS : 80M**

**PART-A**

**Answer All questions. Each question carries THREE marks.** **10x3=30M**

1. Solve $\left(D^2-3D+2\right)y=0.$ **CO1**
2. Solve $\left(D^2+D+1\right)y=0.$ **CO1**
3. Find the particular integral of differential equation $\left(D^2+4\right)y=\sin 2x.$ **CO1**
4. Find the particular integral of differential equation $\left(D^2+3D+2\right)y=e^{3x}.$ **CO1**
5. Find $L\left\{2e^{3t}+\sin 3t+\cosh t\right\}.$ **CO2**
6. Find $L\left\{e^t\cos 4t\right\}.$ **CO2**
7. Find $L^{-1}\left\{\frac{1}{s^2}+\frac{4}{s^2+4}+\frac{3s}{s^2-9}\right\}.$ **CO2**
8. Find the value of $a_0$ in the Fourier expansion of $f(x)=e^x$ in the interval $(0,2\pi).$ **CO3**
9. Find the Fourier coefficients of $f(x)$ in the interval $(-\pi,\pi).$ **CO3**
10. Find the value of $a_1$ in the half range cosine series of $f(x)=k$ in the interval $(0,\pi).$ **CO3**

**PART-B**

**Answer All questions. Each question carries EIGHT marks.** **5x8=40M**

11. A) Solve $\left(D^3-6D^2+11D-6\right)y=0.$ **CO1**

Or

B) Solve $\left(D^2-9\right)y=e^{3x}+e^{-3x}.$ **CO1**

12. A) Solve $\left(D^2-4D+4\right)y=\sin 3x.$ **CO1**

Or

B) Solve $\left(D^2+2D+2\right)y=x^2+x+1.$ **CO1**

13. A) Evaluate $L\left\{te^t\cos t\right\}.$ **CO2**

Or

B) Evaluate $L\left\{t^2\cos 2t\right\}.$ **CO2**

14. A) Evaluate $L\left\{\frac{\sin 5t\sin t}{t}\right\}.$ **CO2**

Or

B) Evaluate $\int_0^\infty \frac{\sin t}{t}dt.$ **CO2**

15. A) Find $L^{-1}\left\{\frac{1}{s(s+1)(s+2)}\right\}.$ **CO2**

Or

B) Using convolution theorem find $L^{-1}\left\{\frac{s}{\left(s^2+1\right)\left(s^2+4\right)}\right\}.$ **CO2**

**PART-C**

**Answer the following question. Question carries TEN marks. 1x10=10M**

16. Find the Fourier expansion of $f(x)=x+x^2$ in the interval $(-\pi,\pi)$ and hence deduce that $\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}-\frac{1}{4^2}+=\frac{\pi^2}{12}.$ **CO3**

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**STATE BOARD OF TECHNICAL EDUCATION, A.P**

**ENGINEERING MATHEMATICS – C-401**

**TIME : 3 HOURS** **MODEL PAPER- 2** **MAX.MARKS : 80M**

**PART-A**

**Answer All questions. Each question carries THREE marks.** **10x3=30M**

1. Solve $\left(D^2+4D+4\right)y=0.$ **CO1**
2. Solve $\left(D^2+9\right)y=0.$ **CO1**
3. Find the particular integral of differential equation $\left(D^2-4D+3\right)y=e^{4x}.$ **CO1**
4. Find the particular integral of differential equation $\left(D^2-4D-5\right)y=\cos 2x.$ **CO1**
5. Find $L\left\{2-e^{-2t}+\sinh 6t\right\}.$ **CO2**
6. Find $L\left\{e^{-2t}t^2\right\}.$ **CO2**
7. Find $L^{-1}\left\{\frac{1}{s^2}+\frac{4}{s^2+4}+\frac{3s}{s^2-9}\right\}.$ **CO2**
8. Find the value of $a_0$ in the Fourier expansion of $f(x)=x+x^2$ in the interval $(-1,1).$ **CO3**
9. Write Euler's formula of Fourier expansion of $f(x)$ in the interval $(c,c+2\pi).$ **CO3**
10. Find the value of $a_1$ in the half range cosine series of $f(x)=\pi$ in the interval $(0,\pi).$ **CO3**

**PART-B**

**Answer All questions. Each question carries EIGHT marks.** **5x8=40M**

11. A) Solve $\left(D^3+1\right)y=0.$ **CO1**

Or

B) Solve $\left(D^2+D-6\right)y=e^{3x}+e^{-3x}.$ **CO1**

12. A) Solve $\left(D^2-3D+2\right)y=\cos 3x.$ **CO1**

Or

B) Solve $\left(D^2+2D+1\right)y=2x+x^2.$ **CO1**

13.A) Evaluate $L\left\{e^{3t}\cos^2 t\right\}$. **CO2**

Or

B) Evaluate $L\left\{t^2\cos 2t\right\}$. **CO2**

14.A) Evaluate $L\left\{\frac{e^{-at}-e^{-bt}}{t}\right\}$. **CO2**

Or

B) Using Laplace transforms evaluate $\int_0^\infty \cos 3t dt$. **CO2**

15.A) Find $L^{-1}\left\{\log\left(\frac{s^2+1}{(s-1)^2}\right)\right\}$. **CO2**

Or

B) Using convolution theorem find $L^{-1}\left\{\frac{1}{(s^2+1)(s+1)}\right\}$. **CO2**

**PART-C**

**Answer the following question. Question carries TEN marks.** **1x10=10M**

16. Find the Fourier expansion of $f(x)=(\pi-x)^2$ in the interval $0 \prec x \prec 2\pi$ and hence deduce that $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+---=\frac{\pi^2}{6}$. **CO3**

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# DESIGN AND DETAILING OF R.C. STRUCTURES

| Course code | Course title | No. of period/week | Total no. of periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-402 | Design and Detailing of R.C. Structures | 05 | 75 | 20 | 80 |

| S. No. | Major Topics | No. of Periods | COs Mapped |
|---|---|---|---|
| 1. | Introduction to R.C.C and Principles of Working Stress Method | 08 | CO1 |
| 2. | Philosophy of Limit State Design | 05 | CO2 |
| 3. | Analysis and Design of Rectangular Beams | 15 | CO2 |
| 4. | Design of Slabs | 10 | CO2 |
| 5. | Analysis of T-beams | 09 | CO3 |
| 6. | Design of continuous slabs and beams | 10 | CO3 |
| 7. | Design of columns | 09 | CO4 |
| 8. | Design of footings | 09 | CO4 |
| | Total | 75 | |

***COURSE OBJECTIVES:***

| *Upon completion of the course the student shall be able to* | | |
|---|---|---|
| **Course Objectives** | (i) | Make student to be familiar with the principles of methods of design of R.C. Elements subjected to flexure, compression, shear and torsion. |
| | (ii) | Enable the student to design various R.C. Building Elements. |

***COURSE OUTCOMES:***

| | | | |
|---|---|---|---|
| **Course Outcomes** | CO1 | C-402.1 | Explain principles of Working stress design |
| | CO2 | C-402.2 | Design singly reinforced & doubly reinforced R.C.C rectangular beams and slabs using Limit state method |
| | CO3 | C-402.3 | Design T-beam, Continuous beams & slabs using Limit state method. |
| | CO4 | C-402.4 | Design columns & footings using Limit state method |

**LEARNING OUTCOMES:**

| | |
|---|---|
| **Learning Outcomes** | **1.0 Introduction to R.C.C and Principles of Working Stress Method**<br>1.1 Differentiate Cement concrete and reinforced cement concrete. List the advantages and disadvantages of R.C.C.<br>1.2 List the material used in R.C.C. and their functions in R.C.C. State the reasons for using steel as reinforcement.<br>1.3 List the different codes used in R.C.C. List the Loads to be considered in the design of R.C. elements.<br>1.4 State the different grades of concrete and different permissible stresses in concrete (Working Stress Method) as per IS 456 – 2000. Differentiate the nominal mix concrete and design mix concrete.<br>1.5 Write the equations of tensile strength and modulus of elasticity of concrete as per IS 456 – 2000. State properties of concrete viz., Poisson's ratio, Creep, Shrinkage, Workability and Unit weight.<br>1.6 List different types of steel and their permissible stresses in steel (Working Stress Method) as per IS 456 – 2000. State modulus of elasticity and unit weight of steel.<br>1.7 State different methods of designing R.C. elements.<br>1.8 State the assumptions made in Working Stress Method as per IS 456 – 2000. Define modular ratio. Write the equation of modular ratio in working stress method. Sketch the stress distribution and transformed area of R.C. section.<br>1.9 Define Effective depth, Neutral axis, Lever arm and Moment of resistance. Describe balanced section, under reinforced section and over reinforced sections with sketches.<br>1.10 Calculate Neutral axis, Lever arm and Moment of resistance for a singly reinforced rectangular beam. Design a singly reinforced rectangular beam subjected to flexure.<br><br>**2.0 Philosophy of Limit State Design**<br>2.1 Define Limit State.<br>2.2 State different limit states.<br>2.3 Distinguish 'strength' and 'service ability' limit states<br>2.4 List different IS: 456 – 2000 code provisions for Limit state method of design.<br>2.5 Define characteristic strength of materials and characteristic loads.<br>2.6 Differentiate Nominal Mix and Design Mix.<br>2.7 Explain the role of partial safety factors in limit state design.<br>2.8 Define Design strength of materials and Design loads.<br>2.9 State the assumptions made in the limit state design.<br>2.10 State the differences between the Working stress method and Limit state method of design of R.C. elements.<br><br>**3.0 Analysis and Design of Rectangular Beams**<br>3.1 Sketch stress and strain diagrams for a singly reinforced rectangular beam indicating appropriate stress and strain values in compression zone and tension zone of the beam, also the strain value at the junction of parabolic and rectangular stress blocks. Calculate the depth of rectangular and |

| | |
|---|---|
| | parabolic stress blocks.<br>3.2 Calculate the total compressive force and total tensile force resisted by the singly reinforced rectangular beam. Calculate the depth of neutral axis from the equilibrium condition. Define lever arm. Write the equation for lever arm for a singly reinforced rectangular beam.<br>3.3 Explain – why the over reinforced sections are not recommended? Calculate the maximum depth of neutral axis. Calculate the limiting value of moment of resistance with respect to concrete and steel. Calculate the limiting percentage of steel.<br>3.4 State the general design requirements for beams in limit state design as per IS 456 – 2000 (Effective span, limiting stiffness, minimum tension reinforcement, maximum tension reinforcement, maximum compression reinforcement, spacing of main bars, Cover to reinforcement, side face reinforcement.)<br>3.5 Calculate the depth of neutral axis for a given section and decide whether the section is balanced or under reinforced or over reinforced and calculate the moment of resistance for the respective case. Calculate the area of steel for a given beam with given cross section and loading.<br>3.6 Design a singly reinforced beam as per IS 456 – 2000 for flexure only with the given grade of steel and concrete and check the designed beam for deflection as per IS 456 – 2000.<br>3.7 Explain the effect of shear on beam. Explain the shear stress distribution across a homogeneous section and reinforced concrete section with sketches. Explain the design shear strength and maximum shear stress in different grades of concrete as per IS 456 – 2000. Explain the need for shear reinforcement and different forms of shear reinforcement provided in beams. Explain the critical section for shear.<br>3.8 Calculate the shear strength of concrete, shear resistance of vertical stirrups, shear resistance of bent up bars as per IS 456 – 2000. State the minimum shear reinforcement and maximum spacing of shear reinforcement as per IS 456 – 2000. Calculate the nominal shear stress, shear resisted by bent up bars and spacing of vertical stirrups.<br>3.9 Design the shear reinforcement for beams. Design a singly reinforced beam as per IS 456 – 2000 with the given grade of steel and concrete and check the designed beam for shear and deflection as per IS 456 – 2000 and design the shear reinforcement as per 456 – 2000.<br>3.10 State the situations which require doubly reinforced beams.<br>3.11 Determine the moment of resistance for a given doubly reinforced section (given d'/d – $f_{sc}$ values). Design a doubly reinforced beam with the given data.<br>3.12 Calculate the allowable working load on singly reinforced beam and doubly reinforced rectangular beam for the given span.<br>3.13 Calculate the development length of bars in compression, tension, and the curtailment position for main tension bars. State the importance of anchorage values of reinforcement.<br>3.14 Design a singly/doubly reinforced simply supported rectangular beams for the given grades of materials, span and loading for flexure including shear design with the curtailment of reinforcements and check for the deflection using simplified approach of the code. |

3.15 Design an independent lintel subjected to triangular loading.

**4.0 Design of Slabs**

4.1 Distinguish one-way slabs and two way slabs.
4.2 List the types of slabs based on support conditions.
4.3 Explain the general design requirements of slabs as per IS 456 – 2000.
4.4 Explain the functions of distribution steel in slabs.
4.5 Sketch the general reinforcement details for a
1) One-way slab simply supported on two parallel sides
2) One-way slab simply supported on four sides
3) Two way simply supported slab
4) One-way continuous slab
5) Cantilever slab continuous over a support and
4.6 Explain the edge strip and middle strip of a two-way slab.
4.7 Sketch the general reinforcement details for a continuous two-way slab for its edge strip and middle strip using straight bars and bent up bars.
4.8 Design one-way slab for given grades of materials, loads and span for flexure and including shear check, check for deflection using stiffness criteria.
4.9 Explain Load distribution in two-way slabs. Design two-way slab with different end conditions for flexure including shear using B.M and S.F coefficients. Calculate the area of torsional reinforcement in the restrained slabs. Check the deflection using simplified approach of stiffness criteria.
4.10 Classify the stairs based on the structural behaviour or support condition. Sketch the detailing of reinforcement in stairs spanning longitudinally (Dog legged staircase only)

**5.0 Analysis of T-beams**

5.1 Distinguish T- beam and L- beam.
5.2 List the advantages of a T- beam.
5.3 Write formula for effective width of flange of a T- beam and L- beam as per IS 456 – 2000.
5.4 Calculate the effective width of flange of an isolated T- beam as per IS 456 – 2000.
5.5 Describe the three cases of determining Neutral axis of T-beams with sketches and notations.
5.6 Calculate the depth of neutral axis and moment of resistance of the given Tee section using the expressions given in the code.
5.7 State the minimum and maximum reinforcement in T- beams as per 456 – 2000.

**6.0 Design of Continuous beams and slabs**

6.1 Explain the behaviour of continuous beams and slabs subjected to loading.
6.2 List the advantages of continuous beams or slabs.
6.3 Draw the line diagram of a continuous beam or slab and indicate the bending moment and shear force values at salient points as per IS 456 – 2000.

| | |
|---|---|
| | 6.4 Sketch the position of sagging (+ve) and hogging (-ve) bending moments along the continuous beam or slab.<br>6.5 Sketch the general reinforcement details for a continuous beam or slab.<br>6.6 Calculate the B.M and S.F of continuous beams and slabs (Minimum of three spans) at critical sections using B.M and S.F coefficients given in the code.<br>6.7 Design a continuous beam or slab as per code at a given section only.<br>**7.0 Design of columns**<br>7.1 Define a column/compression member. Differentiate among Column, Strut, Pedestal and Post<br>7.2 Explain the need for providing reinforcement in column.<br>7.3 State the effective length of column for different end conditions as per theory and as per code.<br>7.4 Classify the columns based on type of reinforcement, loading and slenderness ratio.<br>7.5 State the slenderness limits for column to avoid buckling of column.<br>7.6 State the minimum eccentricity of column.<br>7.7 Calculate the load carrying capacity of a short column with lateral ties and with helical reinforcement as per IS 456 – 2000.<br>7.8 Differentiate between short and long columns and understand their failure behaviour.<br>7.9 Explain the design requirements of columns as per IS 456 – 2000.<br>7.10 Design a Short Square, rectangular, circular column with lateral ties (subjected to axial load only).<br><br>**8.0 Design of Footings**<br>8.1 Define Footing<br>8.2 State different types of Footings (Square/ Rectangular Isolated footings of Uniform/Tapered sections).<br>8.2 State the Rankine's formula for minimum depth of foundation.<br>8.3 State the code provisions for the design of R.C.C footings.<br>8.3 Explain the procedure of checking the footing for one-way shear, two-way shear, bearing stress and for development length.<br>8.5 Design isolated square footing of uniform thickness under a column for flexure only. |

**Note:** Students may be encouraged to use design aids SP-16, SP-34 and SP-23 for design of slabs, beams for general practice. I.S.456 – 2000 is allowed in the Examination.

**PO-CO Mapping:**

| Course Code : C-402 | Course Title: Design and Detailing of R.C. Structures No of COs : 4 | | | | No. of Periods: 75 |
|---|---|---|---|---|---|
| POs | Mapped with CO No | CO Periods addressing PO in Column 1 | | Level (1,2,3) | Remarks |
| | | No | % | | |
| PO1 | CO1,CO2, CO3, CO4 | 19 | 25.5 | 2 | > 40% Level 3 (Highly addressed) 25% to 40% Level 2 (Moderately addressed) 5 to 25% Level 1 (Low addressed) < 5% (Not addressed) |
| PO2 | CO1,CO2,CO3, CO4 | 30 | 40 | 3 | |
| PO3 | CO1,CO2, CO3, CO4 | 19 | 25.5 | 2 | |
| PO4 | CO1,CO2 | 2 | 3 | - | |
| PO5 | | | | | |
| PO6 | | | | | |
| PO7 | CO1,CO2, CO3, CO4 | 5 | 6 | 1 | |

**CO-PO Mapping:**

| CO No. | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 1 | 1 | - | 1 | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 1 | - | - | 1 | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 3 | - | - | - | 1 | 3 | 3 | 3 |
| **CO4** | 3 | 3 | 3 | - | - | - | 1 | 3 | 3 | 3 |
| **Average** | 3.0 | 2.75 | 2.75 | 1.0 | 1 | - | 1 | 3 | 3 | 3 |

**Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**
**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions**
**(vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits ..etc.**

**COURSE CONTENT**

**1.0 Introduction to R.C.C and Principles of working stress method**

Introduction - advantages and disadvantages of R.C.C - Loads to be considered in design - Introduction to I.S Codes - Assumptions in working stress method - Behaviour of concrete and steel under working loads - Modular ratio – critical percentage of steel - Balance, under reinforced, over reinforced sections - Critical and actual depth of neutral axis of a singly reinforced beams – M.R of simply supported singly reinforced beam sections - Design of singly reinforced rectangular beam for flexure.

**2.0 Philosophy of limit state Design**

Codes of practice of R.C.C design - Characteristic compressive strength - Modulus of elasticity of concrete - Nominal Mix – Design Mix – differences - Loads to be adopted in R.C.C. design – Dead load, Live load, Wind load (IS 875-1987) - Earth quake load (IS-1893) -

Strength and serviceability limit states - Characteristic strength of materials and characteristic loads - Partial safety factors - Design strength of materials and design loads - Assumptions made in the limit state design.

**3.0 Analysis and design of Rectangular beams**

Stress-strain diagram of singly reinforced R.C.C. beam - Depth of neutral axis, lever arm – M.R of singly reinforced Rectangular section – Balanced, under and over reinforced sections - Critical percentage of steel - Calculation of moment of resistance of the given section - Design of singly reinforced rectangular beam for the given load as per IS 456-2000 - Doubly reinforced sections – Necessity – use - Calculation of neutral axis - moment of resistance for the given section and grades of concrete and steel (no derivation of the equations) - Shear in singly reinforced beams - Nominal shear stress - Permissible shear stress - Methods of providing shear reinforcement in the form of vertical stirrups - combination of vertical stirrups and bent up bars - Code provisions for spacing of stirrups and minimum shear reinforcement (no derivation of equations) - Development of bond stress in reinforcing bars - Design bond stress - Development length – Bond and anchorage concepts and their importance - Curtailment of tension reinforcement - Simple problems on development length - Design of simply supported singly and doubly reinforced rectangular beams for flexure including shear and check for deflection using stiffness criteria - Use of design aids (SP-16) - Design of an independent lintel subjected to triangular loading.

**4.0 Design of slabs**

Slabs as structural and functional members - One way and two way slabs - Minimum reinforcement and maximum spacing of reinforcement concrete cover - Stiffness criterion-stiffness ratios for simply supported, cantilever and continuous slabs - One way and two way slabs with various end conditions as per I.S:456 code - Design of one-way slab for flexure and shear for the given grades of concrete, steel, span and loading - Check for deflection using simplified approach of stiffness criteria - Design of two-way slabs with different end conditions, using B.M and S.F coefficients for the unrestrained and restrained conditions as per code - Design of torsion reinforcement for the restrained slabs - Deflection check using stiffness criteria - Use of design aids (SP-16) - Detailing of reinforcement in stairs spanning longitudinally.

**5.0 Design of T-beam**

Conditions needed for design of a beam as T-Section – Advantages - Code provisions for effective flange width - Three cases of tee beams - Neutral axis, lever arm and moment of resistance for under reinforced, balanced sections using the equations given in the code (no derivations of equations) - Calculation of the moment of resistance of Tee section using the equations given in the code - Use of design aids (SP16).

**6.0 Design of Continuous beams and Slabs**

Behaviour of continuous members - Advantages of continuous beams and slabs - Determination of B.M and S.F of continuous beams and slabs of minimum three spans using BM & SF coefficients given in the code - Use of design aids (SP-16) - Design the tension and shear reinforcement at a given section only.

**7.0. Design of columns**

Definition of column – Difference between Column and Pedestal - Types of columns (Long and Short) - Effective length for different end conditions - Code provisions for design of columns - Square, rectangular and circular columns with lateral ties - Determination of Load carrying capacity of short column - Square, rectangular, circular, helically reinforced column subjected to axial load only - Design of short square, rectangular and circular columns (with lateral ties only).

**8.0 Design of Footings**

Footings - Need for footings - Footings under isolated columns - Loads on footings - Code provisions for design of footings - Size of footings for given bearing capacity - Procedure of checking the footing for one-way shear - Two-way shear - Bearing stress - Development length - Design of an isolated square footing of uniform thickness under a column for flexure only.

**REFERENCE BOOKS:**


1. I.S:456- 2000 Code Book
2. I.S:875 – 1987 Code Book
3. SP-34 - Handbook on concrete reinforcement and detailing (1987).
4. Limit state design of R.C.C structures, Dr. B.C. Punmia, Ashok K.Jain, Laxmi Publication.
5. Design of Reinforced Concrete Structures, S. Ramamrutham, Dhanpatrai publishing company.
6. Design of Reinforced Concrete Structures, V.N. Vazirani and M.M. Ratwani –Khanna publishers.
7. Limit state design of reinforced concrete, P.C. Verghese, PHI Learning
8. Reinforced Concrete Design, N. Krishna Raju & R N Pranesh, New age international publishers.
9. Reinforced Concrete Design, S. Unni Krishna Pillai &Devdas Menon, McGrawHill Education.

**MODEL BLUE PRINT**

| S. No | Major Topics | No. of periods | Weightage of marks | Marks wise Distribution of Weightage | | | | Question wise Distribution of Weightage | | | | COs Mapped |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | R | U | Ap | An | R | U | Ap | An | |
| 1. | Introduction to R.C.C and Principles of Working Stress Method | 08 | 06 | 03 | 03 | -- | -- | 1 | 1 | - | -- | CO1 |
| 2. | Philosophy of Limit State Design | 05 | 06 | 03 | 03 | -- | -- | 1 | 1 | -- | -- | CO2 |
| 3. | Analysis and Design of Rectangular Beams | 15 | 14 | 03 | 03 | 08 | -- | 1 | 1 | 1 | -- | CO2 |
| 4. | Design of Slabs | 10 | 11 | -- | 08 | 03 | -- | | 1 | 1 | -- | CO2 |
| 5. | Analysis of T-beams | 09 | 11 | 03 | -- | 08 | -- | 1 | -- | 1 | -- | CO3 |
| 6. | Design of continuous slabs and beams | 10 | 03 | 03 | -- | -- | -- | 1 | -- | -- | -- | CO3 |
| 7. | Design of columns | 09 | 11 | 03 | -- | 08 | -- | 1 | -- | 1 | -- | CO4 |
| 8. | Design of footings | 09 | 8 | -- | -- | 08 | -- | -- | -- | 1 | -- | CO4 |
| | **Higher order question from Chapter-1,2,3,4, 5,6,7,8** | -- | 10 | -- | -- | -- | 10 | -- | -- | -- | 1 | CO1,CO2,CO3,CO4 |
| | Total | 75 | 80 | 18 | 17 | 35 | 10 | 6 | 4 | 5 | 1 | |

**Table specifying the scope of syllabus to be covered for Unit Test-I & Unit Test-II**

| Unit Test | Learning Outcomes to be covered |
|---|---|
| Unit Test – I | From 1.1 to 4.8 |
| Unit Test – II | From 4.9 to 8.5 |

**Model Paper for Unit Test-I**

**State Board of Technical Education and Training, A.P.**

**Diploma in Civil Engineering (DCE)**

**Fourth Semester: C-402 Design and Detailing of R.C. Structures**

**Time: 90 Minutes** **Unit Test –I** **Maximum Marks : 40**

**PART- A** **16 Marks**

**Instructions:**

**(i) Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks**.

1. (a) The value of factor of safety adopted for concrete as per working stress method is_____ (CO1)

   (b) Partial safety factor adopted for material strength steel as per IS 456 is_____ (CO2)

   (c) As per IS456-200, the basic value of span to depth ratio for simply supported beams for spans upto 10m is _____ (CO2)

   (d) When the ration between longer span to shorter span is greater than 2 such slabs are to be designed as two-way slab (TRUE/FALSE). (CO4)

2. What is the necessity of providing the reinforcement in concrete? Why steel is used as reinforcement. (CO1)

3. State the methods of design of reinforced concrete structures. (CO2)

4. The dimensions of a singly reinforced, simply supported rectangular beam are 300x450mm deep effective, provided with Fe-415 steel and M20 grade concrete. Determine the Limiting moment of resistance of the beam. (CO2)

5. Distinguish between one way slabs and two way slabs. (CO2)

**PART- B** **3 x 8 = 24 Marks**

**Instructions :**

**(i) Answer all questions**

**(ii) Each question carries EIGHT marks**

**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A) Calculate the area of reinforcement required for a simply supported reinforced concrete beam 230x400mm effective depth to resist ultimate moment of 80kN-m. Assume M20 concrete Fe415 steel. (CO2)

(OR)

(B)Design a rectangular simply supported reinforced concrete beam over a clear span of 4.3m. The superimposed load is 20kN/m and support width is 230mm each, use M20 concrete Fe415 steel. Check the design for deflection (CO2)

7. (A) Calculate the ultimate Moment of Resistance of an R.C. beam of rectangular section 300x400mm effective depth. Area of steel consists of 6nos 16mm dia in tension zone and 3nos 16mm dia in compression zone. Assume steel of grade Fe415 and concrete of grade M20 and effective cover to compression reinforcement is 40mm. (CO2)

(OR)

(B) Design a rectangular reinforced rectangular concrete beam for a clear span of 4.0m. The Super imposed load is 35kN/m and the size of the beam is restricted to 250x400mm overall depth. Use M20 grade concrete Fe415 grade steel. Support width is 300mm and effective cover is 40mm. (CO2)

8. (A) An R.C.C. beam 250mm wide and 450mm effective depth is reinforced with 6nos 16mm diameter bars in tension zone of which two bars are cranked up near the support. If the design shear is 120 kN, design the shear reinforcement considering bent up bars. use M20 concrete Fe415 steel. (CO2)

(OR)

(B)A simply supported R.C.C. slab has to be provided for a roof slab of a room of clear dimensions 3x8m. Width of supporting wall is 300mm. The weight of weathering course over the slab is 1 kN/sqm. Take Live load on the slab 2 kN/sqm. Design the slab using M20 grade concrete and Fe415 grade steel. Check the design for stiffness. (CO2)

***

**Model Paper for Unit Test-II:**
**State Board of Technical Education and Training, A.P.**
**Diploma in Civil Engineering (DCE)**
**Fourth Semester: C-402 Design and Detailing of R.C. Structures**

**Time: 90 Minutes** **Unit Test –II** **Maximum Marks : 40**

**PART- A** **16 Marks**

**Instructions :**

**(i) Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1. (a) Maximum diameter of the bar in the slab shall not exceed_____times total thickness of the slab. (CO2)
   (b) Minimum %of tensile reinforcement in slabs when HYSD bars are used___ (CO2)
   (c) The effective width of flange of T-Beam is given by_____ (CO3)
   (d) Minimum no. of longitudinal bars to be used in the circular R.C.C. column is _ (CO4)
2. Find the effective flange width of the following simply supported T-beam. (CO3)

   | | | |
   |---|---|---|
   | Effective span | = | 5.0m |
   | c/c distance between adjacent panels | = | 4m |
   | breadth of web | = | 300mm |
   | Thickness of slab | = | 110mm. |

3. A continuous R.C.C. rectangular beam of size 250x500mm overall is supported on 300x300mm masonry column at a clear interval of 4.0m. Calculate the effective spans. (CO3)
4. For a square column 450x450mm reinforced with 8bars 20mm diameter of grade Fe415 and grade of concrete is M20. Calculate load carrying capacity as per IS code. (CO4)
5. A reinforced concrete column of size 300x300mm carries a load of 700kN. The SBC of soil is 200kN/$m^2$. Find the size of the footing. Use M20 concrete and Fe415 grade steel. (CO4)

**PART- B** **3 x 8 = 24 Marks**

**Instructions :**

**(i) Answer all questions**

**(ii) Each question carries EIGHT marks**

**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A) Calculate the ultimate moment resistance of a T-beam for the following data. (CO3)

   | | |
   |---|---|
   | Width of flange | = 1500mm |
   | Depth of flange | = 150mm |
   | Effective depth | = 600mm |
   | Width of rib | = 300mm |
   | Area of steel in tension | = 3nos 25mm dia. |

   Concrete grade M20 and steel Fe415.

(OR)

(B) A T-beam floor consists of 150mm thick R.C.C. slab monolithic with 300mm wide beams. The beams are spaced at 3.5m intervals and their effective span is 6.0m. If the super imposed load on the slab is 5 kN/$m^2$, design the intermediate T-beam. Use M20 Concrete and Fe415 steel.

(CO3)

7. (A)Design a singly reinforced continuous RC rectangular beam for flexure for the following conditions. Use M20 Concrete and Fe415 steel. (CO3)

| | | |
|---|---|---|
| No. of spans | = | 3 |
| Clear distance between supports | = | 3600mm |
| Width of support | = | 300mm |
| Imposed load(not fixed) | = | 5 kN/m |
| Imposed load (fixed) | = | 7.5 kN/m (excluding self-weight) |

(OR)

(B) Calculate Bending moment at salient points of a singly reinforced continuous beam for the following data. (CO3)

| | | |
|---|---|---|
| No. of spans | = | 4 |
| Clear distance between supports | = | 3300mm |
| Width of support | = | 230mm |
| Imposed load(not fixed) | = | 6 kN/m |
| Imposed load (fixed) | = | 9 kN/m (excluding self-weight) |

8. (A) Design a short column square in section to carry an axial load of 2000kN using M20 Concrete and Fe415 steel. Take load factor of 1.5. (CO4)

(OR)

(B) Design an R.C.C. footing of uniform thickness to carry an axial load of 1000kN from a square column of size 350x350mm. The SBC of the soil is 180 kN/$m^2$ use M20 Concrete and Fe415 steel. (CO4)

oOo

**Model Paper for End Examination:**
**MODEL PAPER - DIPLOMA EXAMINATION, (C–20)**
**DCE—FOURTH SEMESTER EXAMINATION**
**DESIGN AND DETAILING OF R.C. STRUCTURES (C-402)**

***Time*** **: 3 hours ]** **[ *Total Marks* : 80**

**PART—A** **3×10=30 marks**

**Instructions:** ***(1)*** **Answer all questions.**
**(2) Each question carries three marks.**
**(3) Answers should be brief and straight to the point and shall not exceed five simple sentences.**

1. State the loads to be considered in the design of beams as per IS: 875 and IS: 1893. (CO1)

2. State the types of steel used in RC members. Why is steel used as reinforcement? (CO1)

3. State various limit states to be considered in limit state design. (CO2)

4. State how the 'design strength of materials' and 'design loads' are calculated. (CO2)

5. State any four situations in which the doubly reinforced beams are used. (CO2)

6. What are the types of bond? Write the anchorage value for a standard U-type hook. (CO2)

7. Classify the slabs based on spanning directions and support conditions. (CO2)

8. Find the effective flange width of simply supported T-beam with the following data: Effective span—530 m, breadth of web—300 mm, C/C of adjacent panels—4·0 m, Thickness of slab—100 mm. (CO3)

9. Write any three advantages of continuous beams. (CO3)

10. Write any four design specifications of columns. (CO4)

**PART – B** **5 x 8 = 40 marks**

**Answer either (a) or (b) from each questions from Part-B**

11. (A)Design a rectangular simply supported beam over a clear span of 6·0 m to carry a superimposed load of 30 kN/m, the support width is 230 mm. Check for deflection. (CO2)

**(OR)**

(B) Calculate moment of resistance of an RC beam of rectangular section 300 mm × 400 mm deep. Area of steel consists of 5 nos. 20 ϕ in tension side and 3 nos.–18ϕ in compression side. Assume effective cover of 35 mm on both sides. (CO2)

12. (A) Design a one-way slab to carry a live load of 3 kN/$m^2$ over an effective span of 3·5 m. sketch the reinforcement details. (CO2)

**(OR)**

(B) Design a simply supported R.C.C. slab over a roof of a room of clear dimensions 4·5 m x 5·5 m. The width of supporting wall is 300 mm. The slab carries a superimposed load of 2·5 kN/$m^2$ and floor finish of 1 kN/$m^2$. Use M 20 grade concrete and Fe 415 steel. (CO2)

13. (A**)** Find the moment carrying capacity of a T-beam of effective flange width 1300 mm, thickness of slab 110 mm, rib width 300 mm and effective depth 520 mm, reinforced with 4-number of Fe 415 grade steel bars of 16 mm diameter. The concrete used is of grade M20. (CO3)

**(OR)**

(B) A T-beam of effective flange width—1200 mm, Thickness of slab—100 mm, width of rib—300 mm, effective depth—460 mm, Reinforcement—4 nos. 16 mm f bars. Calculate ultimate moment of resistance. (CO3)

14. (A)Design the reinforcement for an axially loaded short square column to carry an axial load of 1200 kN. (CO4)

**(OR)**

(B)Design a square column 400mm ´400mm, 3·3 m long subjected to a working load of 1000 kN. Use M 20 and Fe 415. The column is effectively held in position and direction at both the ends. (CO4)

15. (A) A reinforced concrete column of size 300mm x 300mm carries a load of 750 kN. The safe bearing capacity of soil is 200 kN/$m^2$. Design an isolated column footing with uniform thickness. Use M 20 grade concrete and Fe 415 steel. Check for development length and check for bearing pressure is not required. (CO4)

**(OR)**

(B) Explain the design procedure of isolated square footing of uniform depth under a square column. (CO4)

**PART – C** **1 x 10 = 10 marks**

**Question NO.16 is compulsory and carries 10 marks**

16. A three-span singly reinforced continuous RC rectangular beam carries an imposed load (fixed) of 8 kN/$m^2$ excluding self-weight and imposed load (not fixed) of 6 kN/$m^2$ . The clear distance between supports is 3·6 m and width of support is 300 mm. Design the beam for flexure assuming partial fixity at the discontinuous edges. Use M 20 concrete and Fe 415 steel. (CO3)

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# QUANTITY SURVEYING – I

| Course code | Course title | No. of period/week | Total no. of periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-403 | Quantity Surveying-I | 05 | 75 | 20 | 80 |

| S. No. | Major Topics | No. of Periods | COs Mapped |
|---|---|---|---|
| 1 | Introduction, Units and Specifications | 05 | CO1 |
| 2 | Types of Estimates of Buildings | 13 | CO2 |
| 3 | Detailed Estimates | 30 | CO3 |
| 4 | Analysis of Rates and Abstract Estimates | 15 | CO3 |
| 5 | Earthwork Calculations | 12 | CO4 |
| | **TOTAL** | **75** | |

**COURSE OBJECTIVES:**

| Upon completion of the Course, the student shall be able to | | |
|---|---|---|
| **Course Objectives** | (i) | Familiarize with the fundamentals of quantity surveying, cost estimating & specifications |
| | (ii) | Prepare detailed estimates and abstract estimates for buildings |
| | (iii) | Calculate the volumes of earthwork and reservoir capacities |

**COURSE OUTCOMES:**

| | | | |
|---|---|---|---|
| **Course Outcomes** | CO1 | C-403.1 | Explain the basic concepts of Quantity Surveying, Units and Specifications |
| | CO2 | C-403.2 | Explain different types of estimates |
| | CO3 | C-403.3 | Prepare Lead statement, Data Sheet, Detailed and Abstract estimates for the given Civil Engineering Structure |
| | CO4 | C-403.4 | Compute the volumes of earth work and reservoir capacity |

**LEARNING OUTCOMES:**

| | |
|---|---|
| **Learning Outcomes** | **1.0 Basic concepts of Quantity Surveying, Units and Specifications**<br>1.1 Define:<br>a) Quantity Surveying<br>b) Estimate<br>1.2 State the need for quantity surveying<br>1.3 List different types of estimates<br>1.4 Explain the need for different estimates<br>1.5 Distinguish among element of structure, item of a work & materials of construction<br>1.6 List the duties of Quantity Surveyor<br>1.7 State the units of measurements, data and payment for different items of work and materials using IS: 1200<br>1.8 State two types of taking out measurement.<br>1.9 Explain Centre Line Method & Long and Short Wall Method<br>1.10 Explain the process of taking measurements for different works and tolerances<br>1.11 Define specifications<br>1.12 State the need for specifications<br>1.13 List different types of specifications<br>1.14 State the general specifications for important items of work<br><br>**2.0 Different types of estimates**<br>2.1 List different types of estimates<br>2.2 Explain:<br>a) Approximate or preliminary estimate<br>b) Detailed estimate<br>c) Abstract estimate<br>2.3 State the methods of preparing approximate estimates<br>2.4 Explain:<br>a) Plinth area method<br>b) Cubical content method<br>c) Service unit method<br>2.5 Prepare approximate estimates for residential and non-residential buildings with given data of size/capacity and rates considering cost of building services and other over heads<br>2.6 Explain 'Detailed Estimate' and 'Abstract Estimate'<br>2.7 Differentiate between 'Detailed estimate' and 'Abstract estimate'<br>2.8 Write formats of detailed estimate and abstract estimate<br><br>**3.0 'Detailed estimates' for various Civil Engineering Structures**<br>3.1 State the information required for preparation of detailed estimates of a building<br>3.2 List different methods of taking out quantities<br>3.3 Explain different methods of taking out quantities<br>3.4 Prepare the detailed estimates for various buildings from the given drawings, specifications and site conditions:<br>a) Compound wall and Steps |

| | |
|---|---|
| | b) Single Room with Verandah (Load bearing structure)<br>c) Single storied Residential building with one bed room (1 BHK) (Load bearing structure)<br>d) Single storied Residential building with two bed rooms (2 BHK) (Load bearing structure)<br>e) Two storied residential building (Framed structure)<br>f) Buildings with Sloped roofs like pitched roof, lean to roof, hipped & valley roof<br>3.5 Prepare the estimation for various roof elements of hipped roof.<br>3.6 Prepare the estimation for various elements of a steel roof truss for an Industrial building<br>3.7 Prepare the estimation of a Septic tank with Soak pit.<br><br>**4.0 Analysis of Rates and Abstract estimate**<br>4.1 Define analysis of rates<br>4.2 Explain the purpose of analysis of rates<br>4.3 Explain the following in rate analysis:<br>a) Standard data book<br>b) Standard schedule of rates<br>c) Standard data sheet<br>4.4 Explain the following terms:<br>a) Blasting charges<br>b) Seigniorage charges<br>c) Cess charges<br>d) Stacking charges<br>e) Water charges<br>f) Crushing charges<br>g) Lead charges<br>h) Area allowances on labour component<br>i) Loading and Unloading charges for material<br>j) Overhead charges<br>4.5 Explain cost of material at source and site<br>4.6 Define lead statement, write the format for Lead Statement, Prepare Lead Statement for different materials<br>4.7 List different types of labour wages as per latest SSR<br>4.8 Prepare the data sheet for finished items of works using standard data and SSR<br>4.9 Tabulate the material requirement of mortars and concrete of different proportions<br>4.10 State different items involved in Abstract estimation of a building<br><br>**4.0 Volume of Earth work and Reservoir capacity**<br>5.1 Explain terms:<br>a) Embankment<br>b) Cutting<br>c) Volume of earth work<br>5.2 Define the terms: a) Lead b) Lift<br>5.3 State the standard values of 'Lead' and 'Lift'<br>5.4 Calculate the lead and lift for a given section |

| | |
|---|---|
| | 5.5 List different methods of computing the areas and volumes<br>5.6 Explain:<br>a) Mean sectional area method<br>b) Mid sectional area method<br>c) Trapezoidal rule<br>d) Prismoidal rule<br>5.7 State the limitations of Prismoidal rule<br>5.8 Compute the volumes of an embankment for a given data<br>5.9 Compute the volumes of a cutting for a given data<br>5.10 Prepare detailed estimates for earth work for roads, canals and earthen bunds<br>5.11 Compute gross and effective capacity of a reservoir from the areas of different elevations |

**PO-CO Mapping:**

| **Course Code: C-403** | **Course Title: QUANTITY SURVEYING-I**<br>**No of COs : 4** | | | | **No. of periods: 75** |
|---|---|---|---|---|---|
| **POs** | **Mapped with CO No** | **CO Periods Addressing PO in Col 1** | | **Level (1,2,3)** | **Remarks** |
| | | **No** | **%** | | |
| PO1 | CO1, CO2, CO3, CO4 | 20 | 27 | 2 | >40% Level 3 (Highly Addressed)<br>25% to 40% Level 2 (Moderately Addressed)<br>5% to 25% Level 1 (Low Addressed)<br><5% (Not Addressed) |
| PO2 | CO1, CO2, CO3, CO4 | 55 | 73 | 3 | |
| PO3 | | | | | |
| PO4 | | | | | |
| PO5 | | | | | |
| PO6 | | | | | |
| PO7 | | | | | |

**CO-PO Mapping:**

| **CO No.** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PSO1** | **PSO2** | **PSO3** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | | | | | | 3 | 3 | 3 |
| **CO2** | 2 | 3 | | | | | | 3 | 3 | 3 |
| **CO3** | 2 | 3 | | | | | | 3 | 3 | 3 |
| **CO4** | 2 | 3 | | | | | | 3 | 3 | 3 |
| **Average** | 2.25 | 2.75 | | | | | | 3 | 3 | 3 |

**Note: The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**

**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits ..etc.**

## COURSE CONTENT:

**1. Introduction of Unit measurements and Specifications**

Quantity surveying – Definition of estimate – Need for estimation – Types of estimates – Approximate estimate – Detailed estimate – Abstract estimate – Duties of Quantity Surveyor – Elements of a structure – Item of Work – Materials of construction – Line diagram for preparation of abstract estimate

Units of measurements for various items of civil engineering works as per IS: 1200 - Degree of accuracy in measurement – Deductions for openings in masonry, R.C.C. and Plastering – Painting coefficients

Different Methods of taking out quantities – Centre Line Method – Long and Short Wall Method - Specifications – Necessity – Types of specifications – General specifications of: Earth works, Brick/Stone Masonry with C.M, Reinforced Cement Concrete, Plastering with C.M, Floor finishes with ceramic tiles and marbles and White washing/Colour washing

**2. Types of Estimates of Buildings**

Types of estimates – Preliminary or Approximate Estimate – Detailed Estimate – Abstract Estimate – Definitions – Formats for detailed and abstract estimates - Preliminary or Approximate Estimate – Plinth area method – Cubic rate method – Service Unit method - Problems on Preliminary estimates

**3. Preparation of detailed estimates for various Civil Engineering structures**

Compound wall and steps - Single Room with verandah - Single Storied Residential building with one bed room (1 BHK) - Single Storied Residential building with two bed rooms (2 BHK) - Two storied residential building - Buildings with Sloped roofs like pitched roof, lean-to-roof, hipped & valley roof - Estimation of a steel roof truss - Septic tank with soak pit

4. **Analysis of Rates and Abstract Estimates:**

Cost of materials at source and at site - Standard Schedule of Rates of different materials in buildings works - Types of labour – Wages as per S.S.R - Lead and Lift – Preparation of Lead Statement - Data Sheets – Standard data for materials and labour components for different items of work - Preparation of unit rates for finished items of works using Standard data and S.S.R. - Methods of calculating quantities of ingredients of various proportions of cement concrete.- Provisions for different building services and other overhead charges - Prepare abstract estimate for Single bedroom building (1 BHK), Two bedroom building with verandah (2 BHK).

**5. Earth Work Calculations**

Lead and Lift – Initial and subsequent values - Mid-Ordinate Method – Mean Sectional Area Method – Trapezoidal Rule – Prismoidal Rule for computing volumes in level sections for roads and Canals - Taking out quantities from Longitudinal Section and Cross Section in cutting and embankment of level sections - Capacity of Reservoir from the table of areas and contours

***REFERENCE BOOKS:***

1. Estimating and Costing in Civil Engineering by B.N. Dutta -CBS Publishers and Distributors Pvt Ltd
2. Estimating and Costing by S. C. Rangwala, Charotar Publishing House Pvt Ltd
3. Estimating Construction Costs by Robert L. Peurifoy & Garold D. Oberlender –McGraw-Hill Education

**MODEL BLUE PRINT**

| S. No. | Major Topics | No. of periods | Weightage of marks | Marks wise Distribution of Weightage | | | | Question wise Distribution of Weightage | | | | COs Mapped |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | R | U | Ap | An | R | U | Ap | An | |
| 1. | Introduction, Units and Specifications | 05 | 03 | 03 | -- | -- | -- | 1 | - | - | -- | CO1 |
| 2 | Types of estimates of buildings | 13 | 14 | -- | 06 | 08 | -- | -- | 2 | 1 | -- | CO2 |
| 3. | Detailed estimates | 30 | 22 | -- | 06 | 16 | -- | -- | 2 | 2 | -- | CO3 |
| 4. | Analysis of Rates and Abstract Estimates | 15 | 17 | | 09 | 08 | -- | -- | 3 | 1 | -- | CO3 |
| 5. | Earth work calculations | 12 | 14 | -- | 06 | 08 | -- | -- | 2 | 1 | -- | CO4 |
| | **Higher order question from any or combination of 3,4 & 5 Chapters** | -- | 10 | -- | -- | -- | 10 | -- | -- | -- | 1 | CO3 & CO4 |
| | Total | 75 | 80 | 03 | 27 | 40 | 10 | 1 | 9 | 5 | 1 | |

**TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TEST-I & II**

| Unit Test | Learning outcomes to be covered |
|---|---|
| Unit Test-I | From 1.1 to 3.4 |
| Unit Test-II | From 3.5 to 5.11 |

**Model Paper for Unit Test-I**
**State Board of Technical Education and Training, A.P.**
**Diploma in Civil Engineering (DCE)**
**Fourth Semester: C-403 QUANTITY SURVEYING-I**

**Time: 90 Minutes** **Unit Test –I** **Maximum Marks: 40**

**PART- A** **16 Marks**

**Instructions:**

**(i) Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1. (i) The preparation of bills for the payment is not one of the duties of quantity surveyor (True/False) (CO1)
   (ii) The reinforcement in R.C.C. is measured in kN. (True/False) (CO1)
   (iii) Area of ceiling plastering is equal to the following areas
   (a) Area of plastering of internal walls
   (b) Area of flooring
   (c) Area of plastering of parapet wall
   (d) Area of plastering of external wall (CO3)
   (iv) The order of booking dimensions is
   a) Length, breadth, height
   b) Breadth, length, height
   c) Height, breadth, length
   d) None of the these (CO3)
2. State any three rules in calculating the plinth area of a building (CO2)
3. State units of measurements for (i) Plastering (ii) R.C.C in beams (iii) R.C.C. Sunshades (CO1)
4. A room has 6·0 m × 3·5 m internal dimensions with 300 mm wall thickness. The basement has a cross-section of 400 mm width and 600 mm height. Calculate (a) plinth area and (b) brick masonry in CM (1:8) in basement. (CO3)
5. The internal dimensions of a room are 6m × 4 m. Find the quantity of sand filling in basement, if the height and width of basement are 0.8 m and 0.4 m respectively. The wall thickness of room is 0.30 m. (CO3)

**PART- B** **3 x 8 = 24 Marks**

**Instructions:**

**(i) Answer all questions**

**(ii) Each question carries EIGHT marks**

**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A) Prepare an approximate estimate for a school building with following data:

| | | |
|---|---|---|
| Strength of school | : | 450 students |
| Carpet area per student | : | 1.30 sq. m |
| Lavaratories, baths, corridor, verandah etc. | : | 20% of carpet area |
| Walls | : | 12% of carpet area |
| Plinth area rate | : | Rs.2600 per sq. m |
| Water supply and sanitary arrangements | : | 12 ½% |
| Electrification | : | 7½% |
| Architectural features | : | 1% |
| Fluctuation of rates | : | 5% |

| | | | |
|---|---|---|---|
| Unforeseen items | : | 2% | |
| Petty supervision charges | : | 3% | (CO2) |

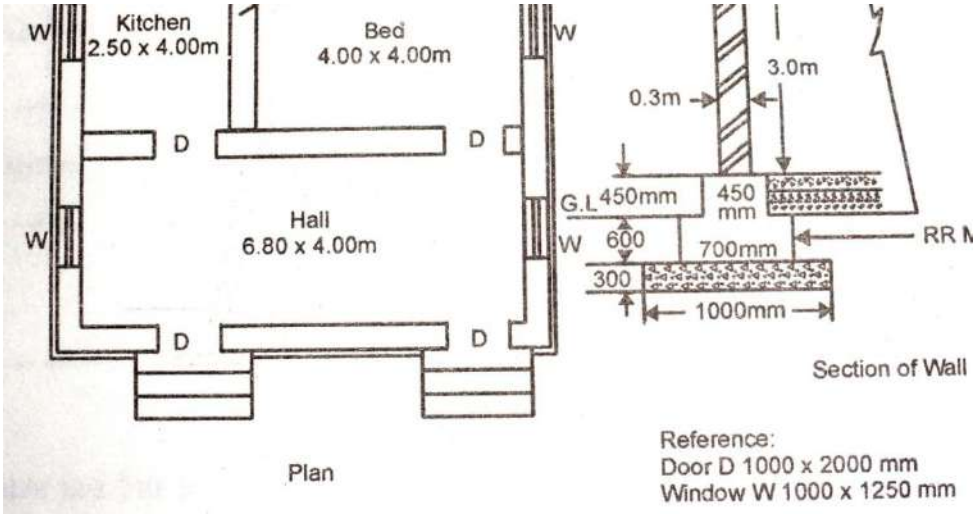
(OR)

(B) Prepare a preliminary estimate of a five storied office building having a carpet area of 1000sqm. Consider 20% of the carpet area for verandah, corridor & staircase and 10% of the carpet area occupied by walls. Take

| | | | |
|---|---|---|---|
| (i) Plinth area rate | : | Rs.1000/sq.m | |
| (ii) Add for architectural works | | 2% of the cost | |
| (iii) Add the water supply & sanitary works | | 6% of the cost | |
| (iv) Add for electrical works | | 3% of the cost | |
| (v) Add for unforeseen items | | 2% of the cost | |
| (vi) Add for supervision charges | | 2.5% of the cost | (CO2) |

7. (A) Prepare the detailed estimate for the following items of works from Drawing No.1

a. Earth work in excavationb. R.C.C. (1:1 ½ :3) for roof slab. (CO3)




**Drawing No.1**

**(OR)**

(B) Prepare the detailed estimate for the following items of works from Drawing No.1

a. Sand filling in basement b. Ceiling plastering (CO3)

8. (A) Explain briefly the 'long-wall & short-wall method' and 'central line method' mentioning the advantages of each one. (CO3)

(OR)

(B) Briefly explain any two methods of Approximate Estimate. (CO2)

***

**Model Paper for Unit Test-II:**
**State Board of Technical Education and Training, A.P.**
**Diploma in Civil Engineering (DCE)**
**Fourth Semester: C-403 QUANTITY SURVEYING-I**

**Time: 90 Minutes** **Unit Test –II** **Maximum Marks: 40**

**PART- A** **16 Marks**

**Instructions:**

**(i) Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1.(i) The rate of item of work depends on

(a) Specifications of work
(b) Specifications of materials
(c) Proportions of mortar
(d) All the above (CO3)

(ii) If the formation level of an highway has a uniform gradient for a particular length and the ground level is having a longitudinal slope, the earth work may be calculated by (CO4)

(a) Mid-sectional formula
(b) Trapezoidal formula
(c) Prismoidal formula
(d) All the above

(iii) If 'b' is the bottom width, 'd' is the depth of cutting and '1 in n' is the side slope of a canal, then the top width is given by_____ (CO4)

(iv) The storage of reservoir between bed level and sluice sill level is called

(a) Gross storage
(b) Effective storage
(c) Dead storage
(d) Any of the above (CO4)

2. Calculate the quantity of cement required in bags for the following item of work:
Plastering with CM (1:4), 12 mm thick for 100 sq. m of work, if 0.16 cum of Cement Mortar is required for 10 sq. m of plastering (CO3)

3. Calculate the quantities of cement, sand and coarse aggregate for preparing 5 cu. m of CC (1 : 2 : 4) using 20 mm HBG metal. (CO3)

4. Explain the terms lead and lift for the formation of roads and give the values of initial lead and initial lift. (CO4)

5. The depths at two ends of an embankment of a road of length 80 m are 2·5 m and 3·4 m. The formation width and side slopes are 12 m and 2:1 respectively. Estimate the quantity of earthwork by mid sectional area method. (CO4)

**PART- B 3 x 8 = 24 Marks**

**Instructions:**

**(i) Answer all questions**

**(ii) Each question carries EIGHT marks**

**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A) Find the cost of the following items of work from the lead statement and labour charges given below:

a) Cost of 1 cum of C.C. (1:4:8)

b) Cost of 1 cum of brick masonry in CM (1:6)

*C.C (1:4:8):*

| | |
|---|---|
| Unit | 1 Cum |
| 40 mm HBG | 0.92 cum |
| Sand | _____ |
| Cement | _____ |
| Masons | 0.2 Nos. |
| Men Mazdoors | 1.8 Nos. |
| Women Mazdoors | 1.4 Nos. |
| Sundries | L.S. |

*Brick masonry in C.M. (1:6):*

| | |
|---|---|
| Unit | 1 Cum |
| Bricks | 512 Nos. |
| CM(1:6) | 0.2 cum |
| Masons | 1.4 Nos. |
| Men Mazdoors | 0.7 Nos. |
| Women Mazdoors | 2.1 Nos |
| Sundries | L.S. |

Lead statement of materials:

| S. No. | Material | Cost at source (Rs.) | Lead in km. | Conveyance charges | Seigniorage charges |
|---|---|---|---|---|---|
| 1. | 40 mm. HBG metal | 110.00/cum | 10 | 3.00/cum/km | 4.50 |
| 2. | Sand | 45.00/cum | 6 | 2.50/cum/km | 3.50 |
| 3. | Bricks | 1600.00/1000 Nos. | 8 | 5.50/1000 Nos./km | -- |
| 4. | Cement | 5000.00/1 MT at site | | | |

Labour charges:

I class masons - Rs.100.00 per day

II class masons - Rs.90.00 per day

Mazdoors - Rs.55.00 pr day

Mixing charges of CM- Rs.20.00 per cum. (CO3)

(OR)

(B) Find the cost of the following items of work from the lead statement and labour charges given below:

a) CR masonry in CM (1:6) in superstructure for 1 cum

| | |
|---|---|
| Unit | 1 Cum |
| Stones | 1.25 cum |
| Mortar | 0.42 cum |
| Masons | 1.2 Nos. |
| Men Mazdoors | 0.7 Nos. |
| Women Mazdoors | 2.6 Nos. |
| Sundries | L.S. |

c) Plastering with Cement mortar (1:6) for 10 sq. m

| | |
|---|---|
| Unit | 1 Cum |
| Cement | 0.046cum |
| Sand | 0.28 cum |
| Masons | 0.8 Nos. |
| Men Mazdoors | 1.8 Nos. |
| Sundries | L.S. |

Lead statement of materials:

| S.No. | Material | Cost at source | Lead in km. | Conveyance charges | Seigniorage charges |
|---|---|---|---|---|---|
| 1. | 40 mm. HBG metal | 110.00/cum | 10 | 3.00/cum/km | 4.50 |
| 2. | Sand | 45.00/cum | 6 | 2.50/cum/km | 3.50 |
| 3. | Bricks | 1600.00/1000 Nos. | 8 | 5.50/1000 Nos./km | -- |
| 4. | Cement | 5000.00/1 MT at site | | | |

Labour charges:

Masons - Rs.90.00 per day
Man mazdoors - Rs.65.00 per day
Woman mazdoors - Rs.60.00 pr day (CO3)

7. (A)A road is to be formed in embankment with the following data

| Chainage in m | 0 | 30 | 60 | 90 | 120 | 150 | 180 |
|---|---|---|---|---|---|---|---|
| R.L. of ground | 98.20 | 98.40 | 97.70 | 97.50 | 98.10 | 98.40 | 98.50 |

Formation width of road is 12 m. Side slopes of embankment are 1½:1. The formation level may be taken as 100.00 throughout the length of road. The ground in transverse direction is level. Calculate the quantity of earth work by

i. Trapezoidal formula
ii. Prismoidal formula (CO4)

**(OR)**

(B) The ground levels along the ridge of proposed canal area are shown below:

| Station | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| Ground Levels | 252.00 | 252.15 | 251.70 | 251.75 | 251.95 | 251.85 | 252.00 |

The bed of the canal is 4.0 m wide and sloped 1 in 100 downwards in longitudinal direction. The side slopes are 2:1 and the bed level of canal at A is 250.00. Determine the volume of the earth work in cutting, if the chainage between the points is 20 m by (a) Trapezoidal Rule (b) Prismoidal Rule (CO4)

8. (A) From the particulars of a reservoir given below, calculate the live and surplus capacity of the reservoir (CO4)

| Contour level in m. | Contour areas in $m^2$ | Particulars |
|---|---|---|
| 110 | 17000 | Bed level of reservoir |
| 120 | 22000 | - |
| 130 | 29000 | Sill of sluice |
| 140 | 32000 | - |
| 150 | 68000 | - |
| 160 | 122000 | F.T.L. |
| 170 | 131000 | M.W.L |

(OR)

(B) From the particulars of a reservoir given below, calculate the capacity of reservoir between the sill level and MWL using Prismoidal and Trapezoidal rule (CO4)

| Contour level in m. | Contour areas in $m^2$ | Particulars |
|---|---|---|
| 40.00 | 1500 | Bed level of reservoir |
| 42.00 | 2800 | - |
| 44.00 | 4200 | Sill of sluice |
| 46.00 | 6500 | - |
| 48.00 | 9500 | - |
| 50.00 | 12000 | F.T.L. |
| 52.00 | 15000 | M.W.L |

oOo

**Model Paper for End Examination:**

**MODEL PAPER – BOARD DIPLOMA EXAMINATION, (C–20)**

**DCE—FOURTH SEMESTER EXAMINATION**

**QUANTITY SURVEYING-I (C-403)**

Time: 3 hours] [Total Marks: 80

**PART—A** **3×10=30 Marks**

***Instructions:*** **(1) Answer all questions.**

**(2) Each question carries three marks.**

**(3) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.**

1. State units of measurements for (i) Plastering
   (ii) R.C.C.
   (iii) Earth work in excavation
   (iv) Flooring. (CO1)
2. List various types of "Approximate Estimates" (CO2)
3. From the following data, calculate the cost of proposed construction of a residential building: - (CO2)
   a) Plinth area of building – 320 sq.m
   b) Cost of structure – Rs. 2,400/- per sq.m
   c) Electrical fittings – 8%
   d) Water supply and sanitary arrangements – 14%
   e) Fluctuation of rates – 5%
   f) P.S. and contingencies – 2%
   g) Architectural aspects – 1%
4. Calculate the quantity of plastering required for a compound wall of 100 m in length, 230 mm thick brick masonry. (CO3)
5. A room has 5.4 m x 3.2 m internal measurements with 300 mm thick wall. The basement has a cross section of 400 mm wide and 600 mm deep. (CO3)
   Calculate(a) Brick masonry in CM (1:6) for basement
   (b) Internal area of plastering (CO3)
6. Determine the quantity of cement required for 5 cum of R.C.C. 1: 2: 4 using 20 mm HBG metal. (CO3)
7. Calculate the cement required in bags for R.R. masonry in CM (1:6) for 22 $m^3$, take 0.34 $m^3$ of CM for 1 $m^3$of masonry
8. Write short notes on the following: (a) Seigniorage charges (b) Cess charges (CO3)
9. Explain the terms lead and lift for the earth work and give the values of initial lead and lift. (CO4)
10. Calculate quantity of earth work for a road, given formation width is 15 m, side slopes are 2:1, depth of embankment at ends is 3.1 m and 4.4 m and length of the road is 1200 m. by mean sectional area method. (CO4)

**PART – B** **8 x 5 marks = 40 marks**

**Answer either (a) or (b) from each questions from Part-B**

11. A) Prepare an approximate estimate for a school building with following data: (CO2)

| | | | |
|---|---|---|---|
| Strength of school | : | 450 students | |
| Carpet area per student | : | 1.30 sq. m | |
| Lavaratories, baths, corridor, verandah etc. | : | 20% of carpet area | |
| Walls | : | 12% of carpet area | |
| Plinth area rate | : | Rs.2600 per sq. m | |
| Water supply and sanitary arrangements | : | 12 ½% | |
| Electrification | : | 7½% | |
| Architectural features | : | 1% | |
| Fluctuation of rates | : | 5% | |
| Unforeseen items | : | 2% | |
| Petty supervision charges | : | 3% | -- 8 marks |

**(OR)**

B) Write short notes on the following: (CO2)

i. Long wall and short wall method of estimating -- 2 marks
ii. Cubical content method of approximate estimate -- 3 marks
iii. Unit rate method of approximate estimate -- 3 marks

12. A) Prepare the detailed estimate for the following items of works from the fig.1

i. Brick masonry in CM (1:6) in super structure -- 4 marks
ii. White washing in two coats for internal walls -- 4 marks

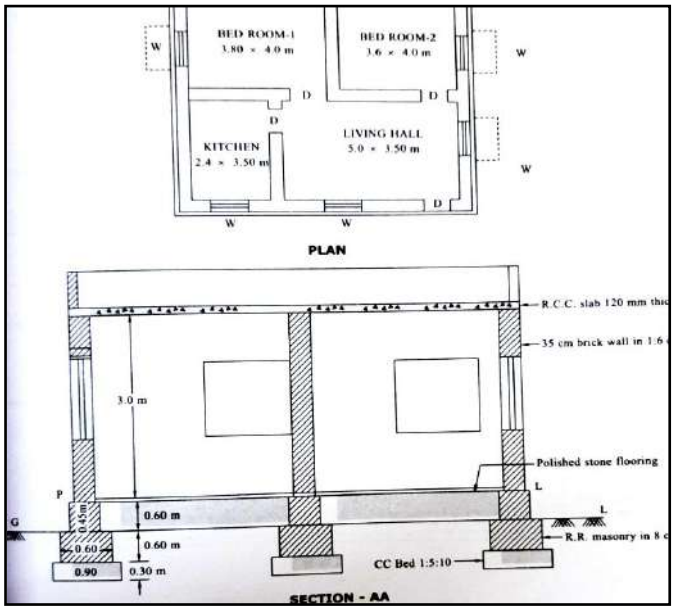



Fig.1 (CO3)

**(OR)**

B) Prepare the detailed estimate for the following items of works from the fig.1 (CO3)

a) Ceiling Plastering with CM (1:5) -- 4 marks

b) R.C.C. (1:2:4) in lintels -- 4 marks

13. A) For the building shown in fig.2, calculate the quantities of the following items of work

i. R.C.C.(M20) using HBG metal for all column footings -- 4 marks

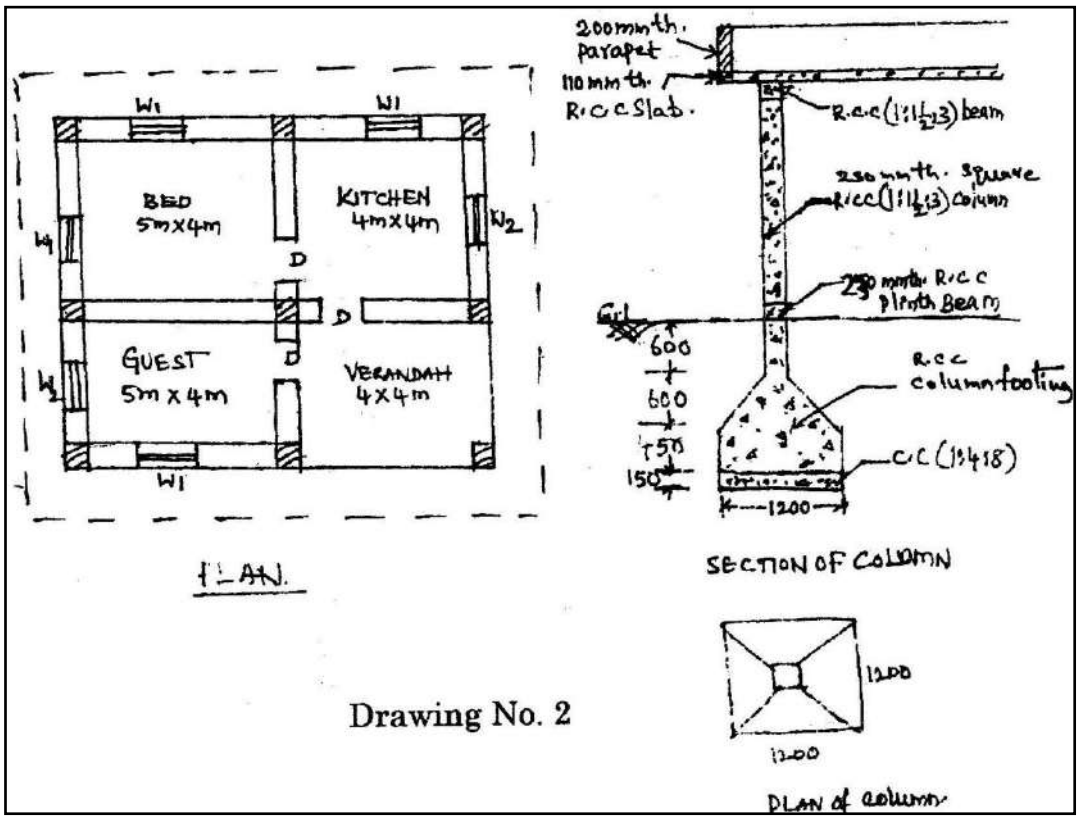
ii. Brick masonry in CM (1:6) without deductions -- 4 marks (CO3)

**(OR)**

B) For the building shown in fig.2, calculate the quantities of the following items of work (CO3)

i. R.C.C. in roof beams -- 4 marks

ii. R.C.C. for sunshades -- 4 marks




Drawing No. 2

14. Find the cost of the following items of work from the lead statement and labour charges given below:

(A) CR masonry in CM (1:6) in superstructure for 1 cum

| | |
|---|---|
| Unit | 1 Cum |
| Stones | 1.25 cum |
| Cement Mortar | 0.42 cum |
| Masons | 1.2 Nos |
| Men mazdoors | 0.7 Nos. |
| Women mazdoors | 2.6 Nos. |
| Sundries | L.S |

**(OR)**

(B) Plastering with Cement mortar (1:6) for 10 sq.m

| | |
|---|---|
| Unit | 1 Cum |
| Cement | 0.046 cum |
| Sand | 0.28 cum |
| Masons | 0.8 Nos |
| Men mazdoors | 1.8 Nos. |
| Sundries | L.S |

**Lead statement of materials:**

| S. No | Material | Cost at Source (Rs.) | Lead in km | Conveyance charges | Seiniorage charges |
|---|---|---|---|---|---|
| 1 | 40 mm. HBG metal | 110.00/cum | 10 | 3.00/cum/km | 4.50 |
| 2 | Sand | 45.00/cum | 6 | 2.50/cum/km | 3.50 |
| 3 | Bricks | 1600.00/1000 Nos. | 8 | 5.50/1000 Nos./km | -- |
| 4 | Cement | 5000.00/1 MT at site | -- | | |

Labour charges:

| | | | |
|---|---|---|---|
| Masons | - | Rs.90.00 per day | |
| Man mazdoor | - | Rs.65.00 per day | |
| Woman mazdoor | - | Rs.60.00 pr day | (CO3) |

15. A) A road is to be formed in embankment with the following data

| Chainage in m | 0 | 30 | 60 | 90 | 120 | 150 | 180 |
|---|---|---|---|---|---|---|---|
| R.L. of ground | 98.20 | 98.40 | 97.70 | 97.50 | 98.10 | 98.40 | 98.50 |

Formation width of road is 12 m. Side slopes of embankment are 1½:1. The formation level may be taken as 100.00 throughout the length of road. The ground in transverse direction is level. Calculate the quantity of earth work by

iii. Trapezoidal formula iv. Prismoidal formula (CO4)

**(OR)**

B) From the particulars of a reservoir given below, calculate the live and surplus capacity of the reservoir

| Contour level in m. | Contour areas in $m^2$ | Particulars |
|---|---|---|
| 110 | 17000 | Bed level of reservoir |
| 120 | 22000 | - |
| 130 | 29000 | Sill of sluice |
| 140 | 32000 | - |
| 150 | 68000 | - |
| 160 | 122000 | F.T.L. |
| 170 | 131000 | M.W.L |

(CO4)

**PART – C**

**Question No.16 is compulsory and carries 10 marks**

16. Calculate the following quantities of a septic tank shown in fig.3 (CO3)

i. C.C (1:4:8) under septic tank. -- 3 marks
ii. Brick masonry in CM (1:5) for side walls -- 4 marks
iii. R.C.C (1:2:4) for roof cover, scum board and baffle wall. -- 3 marks

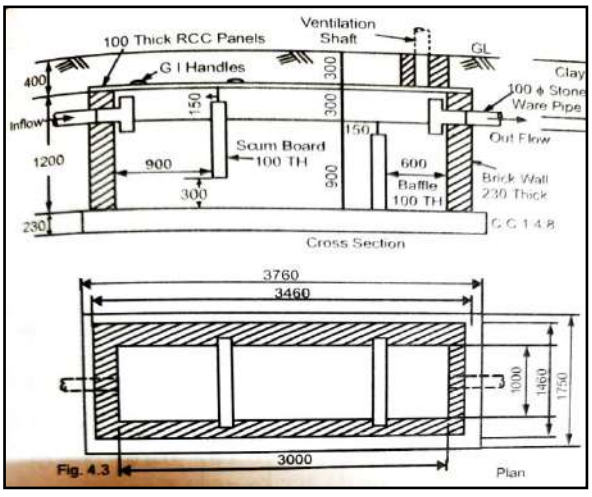



Fig.3

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# TRANSPORTATION ENGINEERING

| Course code | Course title | No. of period/week | Total no. of periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-404 | Transportation Engineering | 04 | 60 | 20 | 80 |

| S.No. | Major Topics | No. of Periods | COs Mapped |
|---|---|---|---|
| 1 | Introduction to Highways and Geotechnical Engineering. | 11 | CO1 |
| 2 | Highway Surveys and Traffic Engineering | 11 | CO2 |
| 3 | Highway Constructions and Maintenances | 12 | CO3 |
| 4 | Introduction and Permanent way of Railways | 11 | CO4 |
| 5 | Station yards and Maintenance of Railways | 07 | CO4 |
| 6 | Basics of Bridge Engineering | 8 | CO5 |
| | **Total** | **60** | |

**COURSE OBJECTIVES:**

| Upon completion of the syllabus, the student shall be able to | | |
|---|---|---|
| **Course Objectives** | (i) | Understand the functions of various components of roads and learn the fundamentals of Geotechnical Engineering |
| | (ii) | Understand the importance of surveys, alignment and geometric features of Highways, bridges and Railways. |
| | (iii) | Differentiate between types of highway pavements, their construction and maintenance |
| | (iv) | Understand the concepts of permanent way, points and crossings, station yards in railways, basics terms used in bridge engineering and state different types of bridges. |

**COURSE OUTCOMES:**

| | | | |
|---|---|---|---|
| **Course Outcomes** | CO1 | C-404.1 | Explain the technical terms of Geo-technical Engineering related to highway engineering |
| | CO2 | C-404.2 | Describe different surveys to be conducted for fixing the alignment of highway. |
| | CO3 | C-404.3 | Discuss the (i) construction of roads (ii) equipment used for high way construction (iii) Maintenance of WBM Road |
| | CO4 | C-404.4 | Describe the components of (i) Permanent way (ii) Station Yards (iii) Maintenance measures of a railway track |
| | CO5 | C-404.5 | Explain the basics of bridge engineering. |

**LEARNING OUTCOMES:**

| | |
|---|---|
| **Learning Outcomes** | **1.0 Introduction to Highways and Geotechnical Engineering**<br>1.1. State the importance of transportation engineering.<br>1.2. State the importance of I.R.C & List the functions of I.R.C<br>1.3. Classify roads as per I.R.C<br>1.4. Define the terms:<br>1. Width of pavement, 2. Shoulder,3. Formation width,<br>4. Right of way, 5. Camber, 6. Gradient,<br>7. Super elevation, 8. Sight distance.<br>1.5. Explain the components of a road with a sketch.<br>1.6. State the three types of gradients<br>1. Ruling gradient, 2. Limiting gradient and<br>3. Exceptional gradients and their recommended values.<br>1.7. State recommended values of gradients by I.R.C<br>1.8. State the need for providing super elevation and write the formula for super elevation<br>1.9 State the need for curves in highways and state the different types of horizontal curves adopted in road. State the different types of vertical curves adopted in road<br>1.10. List physical properties of soils & define the following properties of soils:<br>1. Plasticity, 2. Cohesion, 3. Consolidation, 4. Compaction,<br>5. Permeability, 6. Compressibility<br>1.11. State the different systems of classification of soils &Explain the textural classification of soils and I S Classification of soils.<br>1.12. Define the following terms:<br>1. Ultimate bearing capacity of soil,<br>2. Safe bearing capacity, and<br>3. Net safe bearing capacity.<br>**2. Highway Survey and Traffic Engineering**<br>2.1. Define alignment of road.<br>2.2. State the factors influencing selection of alignment for a road in plain and hilly areas.<br>2.3. List the surveys required for fixing alignment.<br>2.4. State the different data required for the preparation of highway project.<br>2.5. Explain various engineering surveys conducted to fix the alignment of a road.<br>2.6. State the importance of traffic census/traffic surveys.<br>2.7. List various traffic surveys conducted.<br>2.8. Explain the following with sketches:<br>1. Traffic islands<br>2. Interchanges.<br>2.9. State types of pavement markings with sketches and state its functions<br>2.10. State the purpose of traffic signs. State the functions of traffic signs with sketches. |

**3. Highway construction and Maintenance**

3.1. State the need for road drainage.
3.2. Explain the methods of providing surface and sub-surface drainage.
3.3. State the materials used in construction of different types of roads
3.4. List the tests on Bitumen.
3.5. State the equipment/machinery used in construction of different roads.
3.6. Explain the methods of construction of different types of roads.
3.7. Explain the maintenance of WBM of roads.
3.8. Explain the different types of joints used in C.C roads with sketches.
3.9. State the need for joints in C.C roads.

**4. Introduction to Permanent way of Railways**

4.1. State the advantages of Railways.
4.2. Define gauge and
4.3. Classify gauges.
4.4. State the component parts of a permanent way
4.5. List the functions of each component parts of a permanent way
4.6. State the requirements/characteristics of
1. Good rail,
2. Rail joint,
3. Sleeper and
4. Ballast.

4.7. State the different types of
1. Rails,
2. Joints,
3. Rail fittings,
4. Sleepers,
5. Ballast used in Indian Railways with sketches (where ever required).

**5. Station yard and Maintenance of Railways**

5.1 Describe different types of turnouts with sketches.
5.2 Describe different types of crossings with sketches
5.3 Classify stations.
5.4 State different maintenance measures of a railway track.
5.5 State the duties of a permanent way inspector.

**6. Basics of Bridge Engineering**

6.1. Classify the bridges based on materials, position of bridge floor and form/type of super structure.
6.2. Define the terms:
1. Waterway,
2. Linear waterway,
3. Afflux,
4. Vertical clearance,
5. Scour depth, and
6. Free board.

6.3. State the factors influencing selection of site for a bridge.

| | |
|---|---|
| | 6.4. State component parts of a bridge sub-structure with sketches<br>6.5. List the functions of a bridge sub-structure<br>6.6. Distinguish between deck and through bridge.<br>6.7. Draw different types of bridge super structures.<br>6.8. List different types of 1. Causeways and 2. Culverts.<br>6.9. State suitability of different types of culverts and causeways.<br>6.10. Sketch different types of causeways and culverts |

**PO-CO Mapping:**

| **Course Code: C-404** | **Course Title: TRANSPORTATION ENGINEERING No of COs : 5** | | | | **No. Of periods :60** |
|---|---|---|---|---|---|
| **POs** | **Mapped with CO No** | **CO Periods Addressing PO in Col 1** | | **Level (1,2,3)** | **Remarks** |
| | | **No** | **%** | | |
| PO1 | CO1,CO2,CO3,CO4,CO5 | 16 | 27 | 2 | >40% Level 3 (Highly Addressed) |
| PO2 | CO1,CO2,CO3,CO4,CO5 | 28 | 47 | 3 | |
| PO3 | | | | | 25% to 40% Level 2 (Moderately Addressed) |
| PO4 | CO3,CO4 | 8 | 13 | 1 | |
| PO5 | CO3,CO4 | 8 | 13 | 1 | 5% to 25% Level 1 ( Low Addressed) |
| PO6 | | | | | |
| PO7 | | | | | <5% Not Addressed |

**CO-PO Mapping:**

| **CO No.** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PSO1** | **PSO2** | **PSO3** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | | | | | | 2 | 3 | 3 |
| **CO2** | 2 | 3 | | | | | | 2 | 3 | 3 |
| **CO3** | 3 | 2 | | 2 | 2 | | | 2 | 3 | 3 |
| **CO4** | 3 | 3 | | 2 | 2 | | | 2 | 2 | 3 |
| **CO5** | 3 | 3 | | | | | | 2 | 3 | 3 |
| **Average** | 2.6 | 2.6 | | 2 | 2 | | | 2 | 3 | 3 |

**Note: The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**
**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits ..etc.**

**COURSE CONTENT**

1. **Introduction to Highways and Geotechnical Engineering**
   Importance of transportation engineering- Importance of I.R.C - List the functions of I.R.C – Classification of roads as per I.R.C – Define (i) Width of pavement (ii) Shoulder (iii) Formation width (iv) Right of way (v) Camber (vi) Gradient (vii) Super elevation and (viii) Sight distance

components of a road - types of gradients and their recommended values by I.R.C - need for providing super elevation and its formula – Necessity of curves in highways - types of horizontal curves and vertical curves adopted in roads – Physical properties of soil like plasticity, cohesion, consolidation, compaction, Permeability and compressibility - Soil moisture content – Specific gravity and density - Types of soils – Residual soil – Transported soil – sand – silt – clay – peat – Till – Tull – loess – Bentonite – Soils in India - Different systems of classification of soils – Textural classification – I S classification of soils - Bearing Capacity – Definition – Importance in foundation design.

2. **Highway Survey and Traffic Engineering**

Alignment of Road - Definition - factors influencing selection of alignment for a road in plain and hilly areas - List the surveys required for fixing alignment - Different data required for the preparation of highway project - Various engineering surveys conducted to fix the alignment of a road - Traffic census/traffic surveys - Importance – Types – Traffic islands and Interchanges - types of pavement markings and its functions - purpose of traffic signs and its functions

3. **Highway construction and Maintenance**

Necessity of road drainage - Methods of providing surface and sub-surface drainage - materials used in construction of different types of roads - Tests on Bitumen - equipment/machinery used in construction of different roads - Methods of construction of different types of roads - maintenance of WBM of roads - Different types of joints used in C.C roads - necessity for joints in C.C roads

4. **Introduction and Permanent way of Railways**

Railways - advantages – Definition and classification of gauges – Functions of each component part of a permanent way and its requirements/characteristics - Different types of 1. Rails, 2. Joints, 3. Rail fittings, 4. Sleepers, 5. Ballast used in Indian Railways with sketches (wherever required).

5. **Station yard and Maintenance of Railways**

Classification of stations - Types of turnouts and crossings with sketches maintenance measures of a railway track - Duties of a permanent way inspector.

6. **Basics of Bridge Engineering**

Classification of bridges based on materials, position of bridge floor and form/type of super structure - Factors influencing selection of site for a bridge - Data required for preparation of bridge project. Definitions - 1. Waterway 2. Linear waterway 3. Afflux 4. Vertical clearance 5. Scour depth, and 6. Free board - Formulae for economical span and afflux - component parts of a bridge sub-structure with sketches - Functions of a bridge sub-structure - Distinguish between deck and through bridge – sketches of different types of bridge super structures - List different types of 1. Causeways and 2. Culverts - suitability of different types of culverts - suitability of different types of causeways – Sketches of different types of causeways – Sketches of different types of culverts

**REFERENCE BOOKS:**


1. Highway Engineering by S. C. Rangwala,Charotar Books Distributors
2. Railway Engineering by S. C. Rangwala,Charotar Publishing House Pvt. Ltd.
3. Bridge Engineering by S. C. Rangwala,Charotar Publishing House Pvt. Ltd.
4. Highway Engineering by Khanna and Justo-Nem Chand & Sons
5. Transportation Engineering by L.R.Kadiyali,Khanna Publishing House

**MODEL BLUE PRINT**

| S.No | Major Topics | No of periods | Weightage of Marks | Mark wise Distribution of Weightage | | | | Question wise Distribution of Weightage | | | | COs Mapped |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | R | U | Ap | An | R | U | A | An | |
| 1 | Introduction to Highways and Geotechnical Engineering | 11 | 09 | 03 | 06 | | | 1 | 2 | | | CO1 |
| 2 | Highway Surveys and Traffic Engineering | 11 | 11 | 03 | | 08 | | 1 | | 1 | | CO2 |
| 3 | Highway Constructions and Maintenances | 12 | 14 | 03 | 03 | 08 | | 1 | 1 | 1 | | CO3 |
| 4 | Introduction and Permanent way of Railways | 11 | 14 | 03 | 03 | 08 | | 1 | 1 | 1 | | CO4 |
| 5 | Station yards and Maintenance of Railways | 07 | 14 | 03 | 03 | 08 | | 1 | 1 | 1 | | CO4 |
| 6 | Basics of Bridge Engineering | 8 | 8 | | 08 | | | | 1 | | | CO5 |
| | **Higher order question from any or combination of the chapters 2,3,4,5** | | 10 | | | 10 | | | | 1 | | **CO2,CO3,CO4** |
| | Total | 60 | 80 | 15 | 23 | 42 | | 8 | 8 | | | |

**Table specifying the scope of syllabus to be covered for Unit Test-I & Unit Test-II**

| Unit Test | Learning Outcomes to be covered |
|---|---|
| Unit Test – I | From 1.1 to 3.5 |
| Unit Test – II | From 3.6 to 6.10 |

**Model Paper for Unit Test-I**
**State Board of Technical Education and Training, A.P.**
**Diploma in Civil Engineering (DCE)**
**Fourth Semester: C-404 TRANSPORTATION ENGINEERING**

**Time: 90 Minutes** **Unit Test –I** **Maximum Marks : 40**

**PART- A** **16 Marks**

**Instructions:**

**(i) Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1. (a) The longitudinal slope of a road is called_____ (CO1)

   (b) Rise of the outer edge of the road above the inner edge is called _____ (CO1)

   (c) Example for mandatory sign is _____ (CO2)

   (d) The purpose of catch basin in the road drainage system is to _____ (CO3)

2. Define the terms (a) Liquid limit (b) Plasticity index (CO1)

3. Draw the cross section of flexible pavement showing various components. (CO2)

4. What are the traffic signs? State the classification. (CO2)

5. Write any three requirements of good highway drainage system. (CO3)

**PART- B** **3 x 8 = 24 Marks**

**Instructions:**

**(i) Answer all questions**

**(ii) Each question carries EIGHT marks**

**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A) Explain how different engineering surveys are conducted for locating the alignment of road. (CO2)

(OR)

(B) State factors influencing selection of alignment for road project. (CO2)

7. (A) State objects of traffic survey and state various studies that are generally carried out. (CO2)

(OR)

(B) Explain about various traffic signs used in highways. (CO2)

8. (A) State and explain about surface drainage and sub-surface drainage with the help of neat sketches. (CO3)

(OR)

(B) Explain various types of machinery used in highway construction. (CO3)

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**Model Paper for Unit Test-II:**
**State Board of Technical Education and Training, A.P.**
**Diploma in Civil Engineering (DCE)**
**Fourth Semester: C-404 TRANSPORTATION ENGINEERING**

**Time: 90 Minutes** **Unit Test –II** **Maximum Marks : 40**

**PART- A** **16 Marks**

**Instructions:**

**(i) Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1. (i) The expansion of W.B.M_____ (CO3)

(ii)Which of the following causes stresses in Sleepers?

a) Eccentric vertical loads
b) Contact shear stress of wheel and rail
c) Lateral deflection of sleepers
d) Track components (CO4)

(iii) Pick up the incorrect statement from the following:

(a)Fish plates fit the underside of the rail head

(b)Fish plates fit the top of the rail foot

(c) Fish plates fit the web of the rail section

(d) Cross sectional area of fish plates, is normally the same as that of the rail section (CO4)

(iv) The difference between the bridge and culvert is with respect to _____ (CO5)

2. Distinguish between rigid pavement and flexible pavement. (CO3)
3. Write any three functions of railway sleepers. (CO4)
4. Define gauge. State different types of gauges adopted in Indian railways. (CO4)
5. State any three facilities provided in loco yards. (CO4)

**PART- B** **3 x 8 = 24 Marks**

**Instructions:**

**(i) Answer all questions**

**(ii) Each question carries EIGHT marks**

**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A) Explain the method of construction of W.B.M road. (CO3)

(OR)

(B) Explain different stages involved in the construction of cement concrete pavement. (CO3)

7. (A) Explain different types of rail joints with a neat sketch. (CO4)

(OR)

(B) Draw a neat sketch of cross section of a permanent way and indicate the parts and mention the purpose of each part. (CO4)

8. (A) Explain different types of yards with neat sketches. (CO4)

(OR)

(B) State the factors to be considered for selection of site for a bridge. (CO5)

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**Model Paper for End Examination**

**MODEL PAPER – BOARD DIPLOMA EXAMINATION, (C–20)**

**DCE—FOURTH SEMESTER EXAMINATION**

**TRANSPORTATION ENGINEERING (C-404)**

**Time: 3 hours]** **[Total Marks: 80**

**PART—A** **3×10=30 Marks**

**Instructions:(1) Answer all questions.**

**(2) Each question carries three marks.**

**(3) Answers should be brief and straight to the point and shall not exceed five simple sentences**.

1. State any three important functions of I.R.C. (CO1)
2. List any three types of soils (CO1)
3. Define the terms void ratio and porosity. (CO1)
4. State the necessity of widening of roads in curves. (CO2)
5. What is meant by grade separators on roads? (CO3)
6. Distinguish between rigid pavement and flexible pavement (CO3)
7. State the gauges adopted in Indian Railways (CO4)
8. Write any four factors to be considered for selection of site for a railway station (CO4)
9. State four types of station yards and indicate the purpose of each. (CO4)
10. State the types of turn outs and sketch the line diagrams (CO4)

**PART – B** **8 x 5 = 40 marks**

**Answer either (a) or (b) from each questions from Part-B**

11. (A) What are the factors influencing alignment of road in plain and Hilly areas. (CO2)

**(OR)**

(B) Explain briefly various engineering surveys to be conducted to fix the alignment of a road in road Project (CO2)

12 (A) Draw the typical Cross sections of road in embankment and cutting (CO3)

**(OR)**

(B) Explain how the drainage is provided for roads and state its necessity (CO3)

13 (A) Explain the different types of rail joints with an aid of sketches.
(a) According to position of joints
(b) According to position of sleeper (CO4)

**(OR)**

(B) State the functions of each component part of a permanent way. (CO4)

14 (A) Explain the maintenance measures of a railway track. (CO4)

**(OR)**

(B) Sate the duties of a permanent way inspector. (CO4)

15 (A) Mention any five factors influencing the selection of site for a bridge (CO5)

**(OR)**

(B) Explain the suitability of different types of causeways with Sketches of different types of Causeways (CO5)

**PART – C**

**Question No.16 is compulsory and carries** **10 marks**

16. Explain the method of construction of W.B.M road stating the sequence of operations involved, size of stones and type of rollers to be used. Also, sketch the types of road intersections. (CO3)

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# IRRIGATION ENGINEERING

| Course code | Course title | No. of period/week | Total no. of periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-405 | Irrigation Engineering | 04 | 60 | 20 | 80 |

| S. No. | Major Topics | No. of Periods | COs Mapped |
|---|---|---|---|
| 1. | Nature and scope of Irrigation Engineering | 6 | CO1 |
| 2. | Elements of Hydrology | 8 | CO2 |
| 3. | Head works | 8 | CO2 |
| 4. | Gravity dams and Earth dams | 12 | CO3 |
| 5. | Distribution works | 10 | CO4 |
| 6. | Soil Erosion, Water logging, River Training works and Water management | 10 | CO5 |
| 7. | Water and Watershed Management | 6 | CO5 |
| | Total | 60 | |

COURSE OBJECTIVES:

| Upon completion of the course the student shall be able to | | |
|---|---|---|
| **Course Objectives** | (i) | Aware of necessity and scope of Irrigation Engineering, Hydrology, calculation of average annual rainfall of an area and maximum flood discharge |
| | (ii) | Enable to gain knowledge about Storage and diversion Head Works, component parts, effect of percolation, Gravity dams and Earthen dams –failures of these dams and remedial measures. |
| | (iii) | Know about the Distribution works, maintenance of canals, uses of Cross drainage works, causes, effects and prevention of Soil erosion, Water logging, types and uses of river training works, Systems of Water management and Watershed Management. |

**COURSE OUTCOMES:**

| | | | |
|---|---|---|---|
| **Course Outcomes** | CO1 | C-405.1 | Explain various methods of irrigation. |
| | CO2 | C-405.2 | Describe the (i) Elements of Hydrology (ii)Diversion and storage head works. |
| | CO3 | C-405.3 | Analyse different types of failures of dams in construction |
| | CO4 | C-405.4 | Discuss the alignment of canals, cross drainage works and their maintenance |
| | CO5 | C-405.5 | Describe 1. Soil erosion 2. Water logging 3.Systems of Water management and Watershed Management |

**LEARNING OUTCOMES:**

| | |
|---|---|
| **Learning Outcomes** | **1.0 Nature and scope of Irrigation**<br>1.1 Define Irrigation<br>1.2 State the necessity of irrigation.<br>1.3 List advantages and disadvantages of irrigation.<br>1.4 State different types of irrigation<br>1.5 Distinguish between<br>1. Perennial and inundation irrigation,<br>2. Flow and Lift irrigation, and<br>3. Storage and Direct irrigation.<br>1.6 State Principal crops in India and their seasons and explain Kharif crops and Rabi Crops<br>1.7 Define the following terms:<br>1. Duty,<br>2. Delta,<br>3. Base period and<br>4. Crop period<br>1.8 Explain different methods of expressing duty<br>1.9 State the relationship between duty and delta.<br>1.10 Explain the factors affecting duty<br>1.11 State the duty figures for principal crops and Solve simple problems on duty<br>**2.0 Elements of Hydrology**<br>2.1 Describe Hydrological cycle<br>2.2 Explain the term Precipitation<br>2.3 State different types of rain gauges and explain the method of measurement of rainfall using Simon's Rain gauge and Float type automatic recording rain gauge<br>2.4 Explain precautions in setting and maintenance of rain gauges. State uses of rain fall records<br>2.5 Explain method of calculation of average annual rainfall of an area by Theissen's Polygon method and solve the problem on calculation of average annual rainfall by Theissen's Polygon method<br>2.6 Define the following: |

| | |
|---|---|
| | 1. Catchment,<br>2. Intercepted catchment,<br>3. Free catchment and<br>3. Combined catchment area<br>2.7 State the characteristics of<br>1. Good catchment,<br>2. Average catchment and<br>3. Bad catchment<br>2.8 Explain the term Run-off and factors affecting runoff<br>2.9 Explain methods of estimating runoff and solve the problems on estimating run-off<br>2.10 Understand the term maximum flood discharge and explain various methods of determining maximum flood discharge from rain fall records.<br>2.11 State Ryve's and Dicken's Formulae and solve simple problems on estimating maximum flood discharge<br>2.12 Explain the importance of river gauging and Lists the factors for selecting suitable site for a gauging station<br>**3.0 Head works**<br>3.1 Classify the head works and State the suitability of different types of head works under different conditions<br>3.2 State the factors for selecting suitable site for diversion head works<br>3.3 Describe the component parts of Diversion works with sketch<br>3.4 Distinguish between barrages and Weirs<br>3.5 Describe head regulator and scouring sluice with sketch<br>3.6 Describe flood banks and other protective works<br>3.7 Define the terms: Percolation, Percolation gradient, Uplift, scour and uplift pressure<br>3.8 Explain the effects of percolation on irrigation works<br>**4.0 Gravity dams and Earth dams**<br>4.1 Distinguish between Rigid dams and Non-rigid dams<br>4.2 State factors influencing selection of site for reservoirs and dams.<br>4.3 Define the terms: Full reservoir level, Maximum water level, Top bund level, Dead storage, Live storage, Free board, Gravity dam and Spillway.<br>4.4 Explain the causes of failure of gravity dams and their remedies.<br>4.5 Draw the elementary profile of a gravity dam for a given height and draw the practical profile of a low dam.<br>4.6 Explain uplift pressure and explain need for drainage galleries with sketches<br>4.7 Explain construction and contraction joints with sketches<br>4.8 State need and types of grouting of foundations and explain the method of grouting of foundations in gravity dams<br>4.9 State different types of spillways and their suitability and draw sketches<br>4.10 State the situations in which earth dams are suitable<br>4.11 State the three types of earth dams with sketches of typical cross sections<br>4.12 Explain causes of failure of earthen dams and their precautions |

| | |
|---|---|
| | 4.13 Explain the terms with sketches Saturation gradient and Phreatic line<br>4.14 Explain drainage arrangements in earth dams with a neat sketch<br>4.15 Explain the maintenance of earth dams<br>**5.0 Distribution works**<br>5.1 Classify canals.<br>**5.2** State the different methods of canal alignment and the situations in which each is suitable.<br>5.4 Sketch typical cross sections of canals in cutting, embankment and Partial cutting. Explain balanced depth of cutting and its necessity<br>5.5 State the need for canal lining and State advantages and disadvantages of canal linings. Explain different types of canal linings<br>5.6 Explain the maintenance required for canals and their regulation<br>5.7 Explain Lacey's regime theory and Kennedy's silt theory (only explanation of formulae) (No problems)<br>5.8 State need for cross drainage works and State different types of cross masonry works (cross regulator, drainage & communication) and their objectives.<br>5.9 Describe the following with sketches<br>1. Aqueduct,<br>2. Super passage,<br>3. Under tunnel, siphon,<br>4. Level crossing and<br>5. Inlet and outlet<br>6.0 **Soil erosion, water logging, River training works**<br>6.1 Explain terms: Soil erosion, Reclamation and Water logging.<br>6.2 State causes of soil erosion and ill effects of soil erosion<br>6.3 Explain various methods of prevention of soil erosion.<br>6.4 State causes of water logging and ill effects of water logging<br>6.5 Explain various methods of prevention of water logging<br>6.6 State methods of land reclamation.<br>6.7 State different stages of flow of rivers<br>6.8 Explain characteristics of Delta Rivers<br>6.9 Explain term meandering of river<br>6.10 State objectives of river training works and Explain various types of groynes and bell's bunds with sketches<br>**7.0 Water and watershed management**<br>7.1 State soil-water plant relationship.<br>7.2 Describe the following irrigation methods: Broader irrigation, Check basin irrigation, Furrow irrigation, Sprinkler irrigation and Drip irrigation<br>7.3 Explain on farm development and Describe 1. Warabandi system and 2. Water user associations<br>7.4 State the duties of water user associations<br>7.5 Explain the concept of Water shed and Water shed management<br>7.6 State need for watershed development in India and Describe different approaches to water shed management<br>7.7 Explain water harvesting and explain methods of 1. Rain water |

| | |
|---|---|
| | harvesting and 2. Catchment harvesting<br>7.8 Explain soil moisture conservation methods<br>7.9 Explain method of water harvesting through check dams<br>7.10 Explain different methods of artificial recharge of ground water<br>7.11 Explain artificial recharges of ground water using percolation tanks |

**PO-CO Mapping:**

| Course Code: C-405 | Course Title: Irrigation Engineering<br>No of COs : 5 | | | | No. of periods: 60 |
|---|---|---|---|---|---|
| POs | Mapped with CO No | CO Periods Addressing PO in Col 1 | | Level (1,2,3) | Remarks |
| | | Nos. | % | | |
| PO1 | CO1,CO2,CO3,CO4,CO5 | 24 | 40 | 3 | >40% Level 3 (Highly Addressed) |
| PO2 | CO2,CO3,CO4,CO5 | 24 | 40 | 3 | |
| PO3 | | | | | 25% to 40% Level 2 (Moderately Addressed) |
| PO4 | CO2,CO3,CO4,CO5 | 5 | 8 | 1 | |
| PO5 | CO2,CO3,CO4,CO5 | 4 | 7 | 1 | 5% to 25% Level 1 ( Low Addressed) |
| PO6 | | | | | |
| PO7 | CO5 | 3 | 5 | 1 | <5% Not Addressed |

**CO-PO Mapping:**

| CO No. | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | - | | | | | | 2 | 3 | 2 |
| **CO2** | 2 | 3 | | 2 | 3 | | | 2 | 3 | 2 |
| **CO3** | 2 | 3 | | 3 | 2 | | | 2 | 3 | 2 |
| **CO4** | 2 | 3 | | 3 | 3 | | | 2 | 3 | 2 |
| **CO5** | 3 | 2 | | 2 | 2 | | 3 | 2 | 3 | 2 |
| **Average** | 2.25 | 2.75 | | 2.5 | 2.5 | | 3 | 2 | 3 | 2 |

**Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**
**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions**
**(vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits ..etc.**

## COURSE CONTENT

### 1. Nature and scope of Irrigation Engineering

Definitions- Necessity of irrigation - Advantages and disadvantages - Perennial and Inundation irrigation - Flow and Lift irrigation-Direct and Storage irrigation.

Principal crops - Kharif and Rabi crops -Dry and wet crops - Definition of duty, delta, base period, and crop period, Duty-different methods of expressing duty-base period-relationship between duty and delta- factors affecting duty – Requirements for precise statement of duty - Duty figures for principal crops-simple problems on duty.

### 2. Elements of Hydrology

Precipitation – Types of rain gauges – Simon's rain gauge - Float type automatic - recording gauge – precautions in setting and maintenance – rain fall records – Hydrological cycle-average annual rainfall of an area -Theissen's polygon method.

Catchment basin in catchment area - Free catchment - combined catchment - Intercepted catchment – Run- off - Factors affecting run-off - Nature of catchment, run off coefficient - Methods of estimating run off - Empirical formulae

Maximum flood discharge - Methods of determining maximum flood discharge from rainfall records, Ryve's and Dicken's formulae, H.F.L Marks, Gauge reading – Simple problems on M.F.D. - River gauging – Importance – Site selection for river gauging

### 3. Head Works

Classification of head works - Storage and diversion, head works - their suitability under different conditions - Suitable site for diversion works - General layout of diversion works-brief description of component parts of diversion works, brief description of component parts of a weir - Barrages and Weirs.

Head Regulator-scouring sluice-flood banks and other protective works. Percolation - Percolation gradient-uplift pressures - Effect of percolation on irrigation works.

### 4. Gravity dams and Earth dams

Dams - Rigid and non-rigid dams - main gravity dams-failures of gravity dams and remedial measures - elementary profile – limiting height of dam - low dam and high dam - free board and top width – Practical profiles of low dam - uplift pressure - drainage gallery - Contraction joints - Grouting of foundations - spillways

Earth dams – situations suitable for Earth Dams - Types of earth dams - Causes of failure of earth dams and precautions – Saturation gradient and phreatic line-drainage arrangements - Construction details of earth dams - breaching sections - breach filling - Maintenance of earth dams.

### 5. Distribution works

Canals-classification-different methods of canal alignment-typical cross section of canal in cutting, embankment, partial cutting and embankment – Berms - standard dimensions - balancing depth of cutting - canal lining - Necessity - types – Maintenance of canals.

Lacey's regime Silt Theory and Kennedy's Silt Theory (only explanation of formulae)-Comparison of two theories (No problems)

Cross drainage works - Necessity – General description of aqueducts – Super passage – Under tunnel - siphon level crossing- Inlet and outlet.

**6. Soil erosion, Water logging and River Training works**

Soil erosion-methods of prevention of soil erosion-causes and effects- of water logging-preventing water logging methods-land reclamation - Different stages of flow of rivers-characteristics of Delta Rivers - Meandering - Object of river training - River training works-List out the various types of groynes and Bell's bunds.

**7. Water and Watershed management**

Soil - water plant relationship -Irrigation methods-Broader Irrigation, check basin irrigation-Furrow Irrigation-Sprinkler irrigation-Drip irrigation – farm development, water user associations &Warabandi system, Concept of Watershed Management – Objectives of watershed Management – Need for watershed development in India – Integrated and multidisciplinary approach for water shed management, Water Harvesting: Rainwater harvesting, Catchment harvesting – Soil moisture conservation – Check dams – Artificial recharges and percolation tanks.

**REFERENCE BOOKS:**


1. Irrigation and Water Power Engineering, B.C. Punmia,Dr. Pande B.B. Lal, Ashok Kumar Jain,Arun Kumar Jain – Laxmi Publication.
2. Irrigation and Water Power Engineering Das and Madan Mohan Das & Mimi Das Saikia , PHI Publication
3. Irrigation Engineering and Hydraulic structures, Santhosh Kumar Garg , KHANNA PUBLISHERS
4. Irrigation Engineering, N NBasak , McGrawHill Publications

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| S. No. | Chapter Name | Periods allocated | Weightage allotted | Mark wise Distribution of Weightage | | | | Question wise Distribution of Weightage | | | | COs Mapped |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | R | U | Ap | An | R | U | Ap | An | |
| 1. | Nature and scope of Irrigation Engineering | 6 | 17 | 3 | -- | 8 | -- | 1 | -- | 1 | -- | CO1 |
| 2. | Elements of Hydrology | 8 | | 3 | | 3 | -- | 1 | -- | 1 | -- | CO2 |
| 3. | Head works | 8 | 11 | 3 | -- | 8 | -- | 1 | -- | 1 | -- | CO2 |
| 4. | Gravity dams and Earth dams | 12 | 14 | 6 | -- | 8 | -- | 2 | -- | 1 | -- | CO3 |
| 5. | Distribution works | 10 | 14 | 6 | -- | 8 | -- | 2 | -- | 1 | -- | CO4 |
| 6. | Soil Erosion, Water logging, River Training works and Water management | 10 | 14 | 3 | 8 | -- | -- | 1 | 1 | -- | -- | CO5 |
| 7. | Water and Watershed Management | 6 | | 3 | | -- | -- | 1 | -- | -- | -- | CO5 |
| | **Higher order question from any or combination of the chapters 4,5** | | 10 | -- | | -- | 10 | -- | -- | -- | 1 | CO3,CO4 |
| | Total | 60 | 80 | 27 | 8 | 35 | 10 | 9 | 1 | 5 | 1 | |

**TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TEST-I & II**

| Unit Test | Learning outcomes to be covered |
|---|---|
| Unit Test-I | From 1.1 to 4.9 |
| Unit Test-II | From 4.10 to 7.11 |

**Model Paper for Unit Test-I**

**State Board of Technical Education and Training, A.P.**

**Diploma in Civil Engineering (DCE)**

**Fourth Semester: C-405 IRRIGATION ENGINEERING**

**Time: 90 Minutes** **Unit Test –I** **Maximum Marks: 40**

**PART- A** **16 Marks**

**Instructions:**

**(i) Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1. (a) Inundation irrigation system is functional all through the year (True/False) (CO1)

   (b) The process of measurement of discharge and water level of a river is known as _(CO2)

   (c) When the percolating water exerts excessive and when the apron is not sufficiently strong, it may fail due to _____ (CO2)

   (d) The difference between 'Gross Storage' and 'Dead storage' is known as (CO3)

2. Sate any three advantages and three disadvantages of irrigation (CO1)
3. List out the different types of precipitation based on the method of occurrence. (CO2)
4. Write the characteristics of good, average and bad catchment areas. (CO2)
5. State any three functions of canal head regulator (CO2)

**PART- B** **3 x 8 = 24 Marks**

**Instructions:**

**(i) Answer all questions**

**(ii) Each question carries EIGHT marks**

**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A) Explain the method of measurement of rainfall using Symon's rain gauge. (CO2)

(OR)

(B) State any eight points to be considered for site selection of canal head works. (CO2)

7. (A) Draw the layout of head works and explain any four components parts of head works. (CO2)

**(OR)**

(B) State any eight points to be considered for selection of site for gravity dams. (CO3)

8. (A) Define spillway and list any six types of spill ways provided in gravity dams. (CO3)

(OR)

(B) Write short notes on (i) Drainage gallery (ii) Constructions joints in dam. (CO3)

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**Model Paper for Unit Test-II**

**State Board of Technical Education and Training, A.P.**

**Diploma in Civil Engineering (DCE)**

**Fourth Semester: C-405 IRRIGATION ENGINEERING**

**Time: 90 Minutes** **Unit Test –II** **Maximum Marks: 40**

**PART- A** **16 Marks**

**Instructions:**

**(i) Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1.(i) Which of the following statement is correct with reference to earthen dams? (CO3)

a) These dams are very costly as compared to other types

b) Gravity dams are less susceptible to failure as compared to rigid dams

c) These dams are suitable for construction on almost every type of foundation

d) Highly skilled labour is generally not required

(ii)The entire system of canals by which the irrigation water is carried from the head works to the irrigated lands with necessary regulation works are called _____works. (CO4)

(iii) Pick up the correct sequence of the part of a canal system from the following

(a) Head work-distributary-branch canal-minor

(b) Head works-main canal-branch canal-distributary-minor

(c) Head works-main canal-branch canal-minor-distributary

(d) Heads works-branch canal-main canal distributary, minor (CO4)

(iv) The process in which the soil is made infertile and non-productive due to excessive moisture being present in its pores creating anaerobic conditions is called _____ (CO5)

2.State any three situations that are suitable for construction of earthen dams. (CO4)

3. Draw typical cross sections of a canal in cutting, partial cutting and embankment. (CO4)

4. State any three objects of river training works. (CO5)

5. State any three advantages of drip irrigation. (CO5)

**PART- B** **3 x 8 = 24 Marks**

**Instructions:**

**(i) Answer all questions**

**(ii) Each question carries EIGHT marks**

**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A)List different types of earthen dams and draw neat sketches showing each type.(CO3)

(OR)

(B) Explain any four causes of failure of earthen dams and their preventive measures (CO3)

7.(A) List out cross drainage works, explain any two types of cross drainage works. (CO4)

(OR)

(B) Explain two methods of aligning a canal with sketches (CO5)

8. (A) Explain any four types of groynes with sketches. (CO5)

(OR)

(B) List the methods of land reclamation and explain any two methods. (CO5)

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**Model Paper for End Examination**

**MODEL PAPER – BOARD DIPLOMA EXAMINATION, (C–20)**

**DCE—FOURTH SEMESTER EXAMINATION**

**IRRIGATION ENGINEERING-I (C-405)**

**Time: 3 hours]** **[Total Marks: 80**

**PART—A** **3×10=30 marks**

**Instructions: (1) Answer all questions.**

**(2) Each question carries three marks.**

**(3) Answers should be brief and straight to the point and shall not exceed five simple sentences.**

1) Define (a) delta, (b) base period and (c) crop period (CO1)
2) List the uses of rainfall records (CO2)
3) Write any three factors affecting runoff (CO2)
4) Sketch the cross section of a weir and show the components (CO2)
5) List any six situations where earthen dams are suitable. (CO3)
6) State the Loads coming on Gravity Dams. (CO3)
7) What is meant by 'balancing depth of cutting. (CO4)
8) Classify the canals based on their alignment (CO4)
9) State the effects of water logging. (CO5)
10) Briefly explain method water harvesting through check dams. (CO5)

**PART – B** **8 x 5 = 40 marks**

**Answer either (a) or (b) from each questions from Part-B**

11) (A) State the advantages and disadvantages of irrigation. (CO1)

**(OR)**

(B)Sketch and explain the working of Symon's rain gauge. (CO2)

12) (A) Explain briefly the functions of different component parts of a weir with a neat sketch. (CO2)

**(OR)**

(B) Draw the typical layout of a diversion head work and briefly explain the component parts. (CO2)

13) (A) Explain any five causes of failures of gravity dams. (CO3)

**(OR)**

(B) List the common types of spillways and explain about any two. (CO3)

14) (A) Compare between Kennedy's and Lacey's silt theories. (CO4)

**(OR)**

(B) State the need for canal lining and State advantages and disadvantages of canal linings. (CO4)

15) (A) Describe Warabandi system of water management. (CO5)

**(OR)**

(B) Explain artificial recharges of ground water using percolation tanks. (CO5)

**PART – C**

**Question No.16 is compulsory and carries 10 marks**

16) Explain various failures of Earthen Dam and state the remedial measures to prevent the failures. (CO3)

***

# CIVIL ENGINEERING DRAWING – II

| Course code | Course Title | No. of periods/week | Total No. of periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-406 | Civil Engineering Drawing – II | 06 | 90 | 40 | 60 |

| S.No. | Chapter/Unit title Name | No. of periods | COs Mapped |
|---|---|---|---|
| 1. | Culverts & Bridges | 30 | CO1 |
| 2. | Public health engineering drawings | 15 | CO2 |
| 3. | Irrigation drawings | 45 | CO3 |
| | Total Periods | 90 | |

***COURSE OBJECTIVES:***

| Upon completion of the Course, the student shall be able to | | |
|---|---|---|
| **Course Objectives** | 1 | Prepare to scale the different views of culverts, T-beam bridge, public health buildings and basic irrigation engineering drawings. |
| | 2 | Impart skills to student to prepare different views of Irrigation Engineering & Public Health Engineering works using CAD. |

***COURSE OUTCOMES:***

| | | | |
|---|---|---|---|
| **Course Outcomes** | CO1 | C-406.1 | Draw plan, cross section and longitudinal section of Culverts and Bridges from given data |
| | CO2 | C-406.2 | Draw plan, cross section and longitudinal section of Public health engineering works viz., Septic tank, Sanitary block, Overhead tank for a given set of specifications |
| | CO3 | C-406.3 | Draw Plan, cross section and Longitudinal section of Earthen bund, Tank surplus weir, Canal drop, Tank sluice with tower head and canal regulator for a given set of specifications |

**LEARNING OUTCOMES:**

| | |
|---|---|
| **Learning Outcomes** | 1.0 **Culverts & T-Beam bridges**<br>1.1 Draw the plan, cross sectional elevation and longitudinal sectional elevation of 1.Pipe culvert, 2. R.C.C slab culvert<br>1.2 Identify the component parts of the pipe culvert and R.C.C. slab culvert from the given set of specifications.<br>1.3 Label the component parts of a given R.C.C.T-beam bridge<br>1.4 Draw the sectional elevation, plan and cross section of Two span R.C.C. T-beam bridge with square wing walls & with splayed wing and return walls from the set of given specifications<br>**2.0 Public health Engineering works**<br>2.1 Label the component parts of given Public health engineering structures<br>2.2 Draw the sectional elevation, plan and cross section of Public health Engineering works viz., septic tank, sanitary block, overhead tank, from the set of given specifications<br>**3.0 Irrigation Engineering structures**<br>3.1 Label the component parts of given Irrigation Engineering<br>3.2 Draw the sectional elevation, plan and cross section of different Irrigation engineering structures bridge from the set of given specifications |

**PO-CO Mapping:**

| **Course Code: C-406** | **Course Title:Civil Engineering Drawing – II<br>No of COs: 3** | | | | **No. of Periods: 90** |
|---|---|---|---|---|---|
| **POs** | **Mapped with CO** | **CO Periods Addressing PO in Col 1** | | **Level (1,2,3)** | **Remarks** |
| | | **No** | **%** | | |
| PO1 | CO1, CO2, CO3 | 18 | 20 | 1 | >40% Level 3 (Highly Addressed) |
| PO2 | CO1, CO2, CO3 | 36 | 40 | 3 | |
| PO3 | CO1, CO2, CO3 | 36 | 40 | 3 | 25% to 40% Level 2 (Moderately Addressed) |
| PO4 | | | | | |
| PO5 | | | | | 5% to 25% Level 1 (Low Addressed) |
| PO6 | | | | | |
| PO7 | | | | | <5% Not Addressed |

**CO-PO Mapping:**

| CO No. | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | | | | | 2 | 3 | 2 |
| **CO2** | 3 | 3 | 2 | | | | | 2 | 3 | 2 |
| **CO3** | 3 | 3 | 2 | | | | | 2 | 3 | 2 |
| **Average** | 3 | 3 | 2 | | | | | 2 | 3 | 2 |

**Note: The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**

**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits ..etc.**

**COURSE CONTENT**

**1. Simple Culverts & Bridges**

Draw the plan, cross-sectional elevation and longitudinal sectional elevation of

1. Pipe culvert (Single Pipe)
2. R.C.C slab culvert with square returns.
3. R.C.C slab culvert with splayed wings
4. Two-Span R.C.C T-beam bridge with square return walls
5. Two-Span R.C.C T-beam bridge with splayed wing walls and return walls

2. **Public health engineering drawings**

1. Septic tank with details of connections to a dispersion trench/soak pit
2. Sanitary block for a public building
3. R.C.C. rectangular/square overhead tanks

**3. Irrigation engineering drawings**

1. Earthen bunds – Three types.
   a) Homogeneous type b) Zoned embankment type c) Diaphragm type
2. Tank surplus weir with splayed wing walls.
3. Canal drop (Notch type)
4. Head sluice (Head wall type)
5. Tank sluice with tower head.
6. Canal regulator

**REFERENCE BOOKS:**


1. Civil Engineering Drawing-II by N.Srinivasulu -Radiant Publishing House
2. Civil Engineering Drawing-II by M.Chakraborthy -UBS Publications
3. Civil Engineering Drawing-II by Bajaj,Kataria& Raheja -North publication

**MODEL BLUE PRINT**

| S. No | Major Topics | No. of periods | Weightage of marks | Marks wise Distribution of Weightage | | | | Question wise Distribution of Weightage | | | | CO's Mapped |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | R | U | Ap | An | R | U | Ap | An | |
| 1. | Culverts & Bridges | 30 | 20 | -- | 20 | -- | -- | -- | 1 | -- | -- | CO1 |
| 2. | Public health engineering drawings | 15 | 10 | -- | 10 | -- | -- | -- | 1 | -- | -- | CO2 |
| 3. | Irrigation drawings | 45 | 30(10+20) | -- | 30 | -- | -- | -- | 2 | -- | -- | CO3 |
| | Total | 90 | 60 | | 60 | | | | 6 | | | |

**Note**: In question paper Part-A consists of two questions of 10 marks each, one from Public health Engineering drawings and other from Irrigation drawings. Part-B consists of two questions of 20 marks each, one from Culverts & Bridges and other from Irrigation drawings.

**Model Paper for End Examination:**

**MODEL PAPER – BOARD DIPLOMA EXAMINATION, (C–20)**

**DCE—FOURTH SEMESTER EXAMINATION**

**CIVIL ENGINEERING DRAWING- II (C-406)**

**Time: 3 hours]** **[Total Marks:60**

**PART—A** **2×10=20 Marks**

**Instructions:** **(**1) Answer **all** questions.
(2) Each question carries ten marks.
(3) All parts must be drawn to scale.
(4) Any missing data may be assumed suitably.

1. Draw the sectional elevation of a square R.C.C. overhead tank with the following data to a scale of 1: 50

   Height of the tank (from GL to bottom of the tank, i.e., top of floor slab or base slab) = 9·0 m Size of tank = 5·0 m×5·0 m×1·75 m
   Thickness of R.C.C. side walls = 200 mm
   Thickness of R.C.C. base/floor slab = 200 mm
   Thickness of R.C.C. roof slab = 110 mm
   Size of R.C.C. column = 400 mm×400 mm
   No. of R.C.C. column = 4 no. (one at each corner)
   Size of R.C.C. brace beams = 400 mm×350 mm
   Spacing of brace beams = 3·0 m c/c
   Depth of R.C.C. footing below ground level = 2·0 m
   Size of footing at base = 1·6 m×1·6 m
   Thickness of footing at column face = 500 mm
   Thickness of footing at the end = 200 mm
   Thickness of levelling course below the footing = 200 mm, (1: 4 : 8) plain concrete
   Size of ring beam below base slab = 400 mm×450 mm
   Dia. of inflow pipe = 100 mm
   Dia. of outflow pipe = 75 mm
   Size of manhole cover = 600 mm×450 mm
   Show the pipe connections; ladder, water level indicator, ventilating arrangements etc. Assume any other data suitably if needed

2. Draw the cross-section of a homogenous earthen bund with the following specifications to a scale of 1: 50.

   Top width of bund = 1·5 m
   TBL = +57·00 General ground level = +50·00
   Stripped ground level = +49·70
   Side slopes = 1½ : 1 on U/S and 2 : 1 on D/S
   Key trenches = 1·2 m wide and 0·6 m deep at 4·0 m C/C

Protection of upstream face of the bund: The upstream face of the bund is provided with 300 mm thick rough stone revetment over 15 mm thick gravel backing. This revetment is founded on rough stone wall 1·0 m wide 1·0 m deep

Protection of a downstream toe of the bund: A rock toe with 300 m rough stone boulders is provided with 900 mm top width and top level being at +51·20.
Side slopes of rock toe = 1: 1 Sand filter = 200 mm thick on rear side and at the bottom of the rock toe
Toe drain = A longitudinal drain is provided with bottom width 1·0 m and side slopes 1 : 1. This is in line with the outer surface of rock toe and taken to a level of +49·00
Rough stones of 300 mm thick are used for side revetment and bed pitching of toe drain

**PART-B** **2×20=40 Marks**

**Instructions: (1) Answer all questions.**
**(2) Each question carries twenty marks.**
**(3) All parts must be drawn to scale.**
**(4) Any missing data may be assumed suitably.**

3. Draw the longitudinal section of a tank sluice with tower head to a scale of 1: 50.

(1) Tank bund:
Top width = 1·8 m
TBL = +163·500 m
MWL = +162·000 FTL = +161·300
Bed level = +159·100
Side slopes = 1½ : 1 on U/s and 2 : 1 on D/s

(2) Tower head:
Internal diameter = 1·2 m
Top of R.C.C. slab over well = +162·50
Thickness of well staining = 450 mm from top to a depth of 2 m and 600 mm for the remaining height
Opening = 600 mm dia opening is provided in the CC diaphragm 75 mm thick for allowing water into the barrel.
Shutter = Wooden shutter 750 mm wide, 1500 mm depth and 50 mm thick is provided for regulating water
Foundation for well = 3·0 m dia and 600 mm thick

(3) Sluice barrel:
Internal dimensions = 750 mm wide × 1·0 m
Height Roof for barrel = R.C.C. roof slab 150 mm thick Side walls of the barrel = 450 mm thick at top and 600 mm thick at bottom with water face vertical CC foundation = 450 mm thick and 2550 mm wide is laid under barrel

(4) Lead chamber:
Length of wing walls = 1·8 m (horizontal distance)
Distance between wing walls inside to inside at the receiving end = 2·0 m Thickness of walls = 450 mm at top and 600 mm at bottom with water face vertical

Profile of wing walls = Wing walls start from +160·25 (top of barrel slab) at the entrance of the barrel and slopes down to the bed level +159·10.

The slope from GL to bed level is 1½ : 1.

(5) Stilling cistern:

Internal dimensions: 3·0 m × 3·0 m

Side walls = All the side walls including the outer wall having an opening of 600 mm for discharging water into field channel are 600 mm thick at bottom and 450 mm thick at top, having batter on rear side. These walls are taken to canal bund level +160·75

(6) Canal particulars:

Bed width = 600 mm Side slopes = 1:1 on water side and 1½ :1 on rear side up to GL

Bed level = +159·10

Width of canal bund = 900 mm

Canal bund level = +160·750

(7) Rough stone revetment:

(i) 450 mm rough stone revetment is provided on U/s over 150 mm thick gravel backing from bed level to TBL

(ii) Sides of canal are provided with 300 mm thick rough stone revetment over 150 mm thick gravel backing for a length of 1·5 m. Bed pitching is also provided in the canal to a length of 1·20 m with 300 mm size rough stone and a toe is provided at its end and taken to a depth of 600 mm below bed level of canal. Width of toe = 300 mm

(8) General ground level at the site = +159·50

4. Draw the longitudinal sectional elevation and Half plan at Bottom and Half plan at Top of the R.C.C. slab culvert to the scale of 1:50 with the following specifications.

(1) Foundations:

Foundations for abutments and wing walls are taken to the same level

Bottom level of levelling course (CC) = +49.80

Top level of levelling course = +51.10

Width of levelling course = 1.5m

Thickness of C.C foundation bed = 0.5m

Width of C.C foundation bed = 1.5m

Top level of C.C foundation bed = bottom level of abutment and wing walls =+51.60

Bottom width of abutment = bottom width of wing walls = 0.9m

Bed level = +52.60

(2) Super Structure:

Profile of abutments and wing walls = width of abutment and wing walls is 0.9m upto bed level. From bed level the water face is kept vertical and the rear (earth retaining side) side has a batter such that top width is equal to 0.6m (at bed block level)

Thickness of bed block = 250mm

Width of bed block = 600mm

Bottom level of R.C.C. slab = +54.20

Thickness of slab = 200mm

Thickness of wearing coat = 100mm
Top level of wearing coat = +54.50
Kerb width = 200mm Top level of kerb = +54.75
Thickness of parapet wall = 400mm
Top level of parapet wall = +55.25 Length of abutment = 8.6m Width of road way = 7.4m
Length of wing wall = 2.8m

(3) Vent way and other protection works:
Width of vent way = 2.0m
Height of vent way = 1.6m
Bed pitching = 200mm Boulders are provided as bed pirching in the vent way
Cutoff walls = 200mm thick are provided at the ends of vent way
Top level of cut-off wall = B.L =+52.60
Bottom level of cut-off wall = +52.00
CC bed for cut off wall = Foundation for cut off walls consists CC bed 800mm wide and 300mm depth

(4) Side slope revetment:
The side slopes of the stream are provided with 200mm size rough stone boulders at a slope of 1:1 from bed level to formation level.

***

# CONCRETE & SOIL TESTING PRACTICE

| Course code | Course title | No. of period/week | Total no. of periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-407 | Concrete & Soil Testing Practice | 04 | 60 | 40 | 60 |

| S. No. | Major Topics | No. of Periods | COs Mapped |
|---|---|---|---|
| 1. | Tests on Aggregates | 16 | CO1 |
| 2. | Tests on Concrete | 20 | CO2 |
| 3. | Non-Destructive Tests | 8 | CO3 |
| 4. | Tests on Soils | 16 | CO4 |
| | Total | 60 | |

**COURSE OBJECTIVES:**

| Upon completion of the Course, the student shall be able to | | |
|---|---|---|
| **Course Objectives** | (i) | Familiarize with the knowledge of different materials and tools used in Concrete and Soil Testing. |
| | (ii) | Use various basic implements used in testing of various Civil Engineering construction materials. |
| | (iii) | Know the etiquette of working with the fellow work force |
| | (iv) | Reinforce theoretical concepts by conducting relevant experiments/exercises. |

**COURSE OUTCOMES**

| | | | |
|---|---|---|---|
| **Course Outcomes** | CO 1 | C-407.1 | Determine the Specific Gravity of fine and coarse aggregate, Impact value, Crushing value, Abrasion value, Flakiness index and Elongation index of coarse aggregate |
| | CO 2 | C-407.2 | Perform the Workability test of concrete by Slump Cone Test, Compaction factor test and determines the compressive strength and the split tensile strength of concrete and learns to Design a concrete mix |
| | CO 3 | C-407.3 | Perform the Rebound hammer test and Ultrasonic Tests on concrete to know the strength and durability of concrete structures |
| | CO 4 | C-407.4 | Perform various tests on soil to know its properties |

**LEARNING OUTCOMES:**

| | |
|---|---|
| **Learning Outcomes** | **1.0 Tests on Aggregate**<br>**1.1 Specific Gravity of fine and coarse aggregate**<br>• Study the importance of specific gravity of fine and coarse aggregate<br>• State the range of specific gravity values for various naturally available fine and coarse aggregate<br>• Use the apparatus required for conducting specific gravity test on both fine and coarse aggregate<br>• Perform the specific gravity tests for both fine and coarse aggregate<br><br>**1.2 Impact value of coarse aggregate**<br>• Study the significance of impact value of aggregate used for road construction<br>• State the standards on impact value of aggregate used for various civil engineering works as per IS-383<br>• Use the apparatus required for conducting impact test on aggregate<br>• State the procedure for preparing the sample and no. of samples required for the given work<br>• Explain the procedure for conducting impact test on aggregate<br>• Perform impact test on given sample of coarse aggregate<br>• Draw inferences by conducting impact test on different types of natural aggregate<br><br>**1.3 Crushing value of coarse aggregate**<br>• Study the significance of crushing value of aggregate used for various civil engineering works<br>• State the standards on crushing value of aggregate used for various civil engineering works as per IS-383<br>• Use the apparatus required for conducting crushing test on aggregate<br>• State the procedure for preparing the sample and no. of samples required for the given work<br>• Explain the procedure for conducting crushing test on aggregate<br>• Perform crushing test on a given sample of coarse aggregate<br>• Draw inferences by conducting crushing test on different types of natural aggregate<br><br>**1.4 Abrasion value of coarse aggregate**<br><br>• Study the significance of abrasion value of aggregate used for various civil engineering works<br>• State the standards on abrasion value of aggregate used for various civil engineering works as per IS-383<br>• Use the apparatus required for conducting abrasion test on |

| | |
|---|---|
| | aggregate<br>• State the procedure for preparing the sample and no. of samples required for the given work<br>• Explain the procedure for conducting abrasion test on aggregate<br>• Perform abrasion test on given sample of coarse aggregate<br>• Draw inferences by conducting abrasion test on different types of natural aggregate<br><br>**1.5 Flakiness Index of coarse aggregate**<br>• Study the significance of flakiness index of aggregate on strength and workability properties of concrete<br>• State the standards on flakiness index of aggregate<br>• Use the apparatus required for conducting flakiness index of coarse aggregate<br>• Explain the procedure for conducting the flakiness index test on coarse aggregate<br>• Determine the flakiness index of a given sample of coarse aggregate<br><br>**1.6 Elongation Index of coarse aggregate**<br>• Study the significance of elongation Index of aggregate on strength and workability properties of concrete<br>• State the standards on elongation Index of aggregate<br>• Use the apparatus required for conducting elongation Index of coarse aggregate<br>• Explain the procedure for conducting the elongation Index test on coarse aggregate<br>• Determine the flakiness index of a given sample of coarse aggregate<br><br>**2.0 Tests on concrete**<br>• Determine suitability of fresh and hardened concrete for the given conditions of workability and strength<br>• Study the importance of workability on strength properties of concrete<br>• State various types of tests used for measuring the workability of fresh concrete<br>• State standards on workability of concrete used for different places of construction work<br><br>**2.1 Slump cone test**<br>• Use apparatus required for conducting slump test<br>• Explain the procedure for conducting slump test of workability<br>• Perform slump test on the concrete made of given sample of ingredients<br>• Draw inference from test results on slump test of workability of concrete made with coarse aggregate having different elongation index |

| | |
|---|---|
| | • Draw inference from test results on slump test of workability of concrete made with coarse aggregate having different flakiness index<br>• Compare the slumps of concrete made with gap graded coarse aggregate and well graded coarse aggregate<br>• Study the changes in workability with different water-cement ratios<br>• Study the changes in workability by adding dry cement to poorly workable concrete<br>**2.2 Compaction factor test**<br>• State the purpose of compaction of concrete<br>• Use apparatus required for conducting compaction factor test<br>• Explain the procedure for conducting compaction factor test of workability<br>• Perform compaction factor test on the concrete made of given sample of ingredients<br>• Draw inference from test results on compaction factor test of workability of concrete made with coarse aggregate having different elongation index values<br>• Draw inference from test results on compaction factor test of workability of concrete made with coarse aggregate having different flakiness index values<br>• Compare the compaction factors of concrete made with gap graded coarse aggregate and that made with well graded coarse aggregate<br>• Study the changes in compaction factor of a poorly workable concrete by admixtures<br>• Study the methods of enhancing workability of concrete without using any admixtures<br>**2.3 Casting of Cement concrete cubes**<br>• Study the purpose of casting of concrete cubes<br>• Use equipment required for casting of cement concrete cubes<br>• Explain the procedure for casting concrete cubes<br>• Cast the concrete cubes with given ingredients<br>**2.4 Testing of cement concrete cubes for compression**<br>• Study the importance of testing concrete cubes<br>• Use equipment required for conducting compression test concrete cubes<br>• State the precautions to be taken for testing of concrete cubes<br>• Explain the procedure for conducting compression test on concrete cubes<br>• Draw inference from test results on compressive strength of concrete cubes made with coarse aggregate having different elongation index values<br>• Draw inference from test results on compressive strength of concrete cubes made with coarse aggregate having different flakiness index values<br>• Compare the compressive strengths of concrete cubes of concrete |

| | |
|---|---|
| | made with gap graded coarse aggregate and that made with well graded coarse aggregate<br>• Compare the compressive strengths of concrete cubes made and cured with potable water and concrete cubes made and cured with non-potable water<br>**2.5 Split Tensile Strength of concrete**<br>• Study the importance of split tensile strength of concrete<br>• Cast the concrete cylinders with given ingredients<br>• Explain the procedure for conducting split tensile strength test on concrete cylinders<br>• Perform split tensile strength test on concrete cylinder<br>**2.6 Design mix of concrete proportion as per IS: 10262 – 2009**<br>• Study the various elements of design mix of concrete as per IS:10262-2009<br>• Conduct tests to find specific gravity, bulk density and sieve analysis of aggregate for the preparation of design mix of concrete<br>• Write the procedure for design mixing of concrete<br>• Calculate the proportions of ingredients of concrete as per IS:10262-2009<br>• Cast cubes of trail mixes to decide the proportion of concrete<br>• Perform the compression tests on concrete cubes casted as per design mix<br>**3.0 Non-Destructive Tests on concrete**<br>• State the importance of non-destructive tests<br>• State the apparatus/equipment required for the non-destructive tests<br>• Explain the procedure for conducting non-destructive tests<br>• Perform the non-destructive tests like Rebound hammer tests, ultrasonic tests on the given hardened concrete<br>• Record the observations of tests<br>• Draw the inferences from the test results<br>**4.0 Tests on Soils**<br>**4.1 Sieve Analysis – Classification of soil**<br>• Study the classification of various types of soils<br>• Use apparatus required for conducting sieve analysis of soils<br>• Explain the procedure for conducting sieve analysis of soils<br>• Perform sieve analysis over a given soil sample<br>**4.2 Atterberg Limits of Soil**<br>• Study the significance of Atterberg limits of soil in civil engineering activities<br>• Study Atterberg limits of soils<br>• Use apparatus required for conducting tests to determine Atterberg limits of soil<br>• Explain the procedure for conducting (a) Liquid Limit (b) Plastic Limit (c) Shrinkage Limit tests<br>• Perform Limit Test, Plastic Limit Test & Shrinkage Limit Test over given sample of soil<br>• Compare the observations of tests conducted on different types of |

| | |
|---|---|
| | soils<br>• Calculate the Plasticity Index value of a given soil sample from the observations of test<br>• Classify given soil sample based on sieve analysis and Atterberg limits<br>**4.3 Field Density of soil (Sand Replacement Method)**<br>• Study the significance of field density of soil<br>• Use the apparatus required for conducting field density of soil<br>• Explain the procedure for conducting field density test on soil by sand replacement method<br>• Perform field density test of soil by sand replacement method<br>**4.4 Proctor Compaction Test**<br>• Study the significance of proctor compaction test<br>• Use the apparatus required for conducting Proctor's compaction test<br>• Explain the procedure for conducting Proctor compaction test<br>• Perform Proctor compaction test over given sample of soil<br>• Compare the observations of tests conducted on different types of soils<br>• Draw the graph for Proctor's compaction test<br>• Calculate the values OMC and MDD of given soil sample from the observations of test |

**PO-CO MAPPING:**

| **Course Code : C-407** | **Course Title: Concrete & Soil Testing Practice**<br>**Number of COs: 04** | | | | **No. of Periods: 60** |
|---|---|---|---|---|---|
| **POs** | **Mapped with CO No.** | **CO Periods addressing PO in Column 1** | | **Level (1,2,3)** | **Remarks** |
| | | **No** | **%** | | |
| PO1 | CO1, CO2, CO3, CO4 | 8 | 13 | 1 | > 40% Level 3<br>Highly addressed |
| PO2 | CO1, CO2, CO3, CO4 | 24 | 40 | 3 | |
| PO3 | | | | | |
| PO4 | CO1, CO2, CO3, CO4 | 8 | 13 | 1 | 25% to 40% Level 2<br>Moderately addressed |
| PO5 | CO1, CO2, CO3, CO4 | 10 | 17 | 1 | |
| PO6 | CO1, CO2, CO3, CO4 | 10 | 17 | 1 | 5 to 25% Level 1<br>Low addressed |
| PO7 | | | | | <5% Not addressed |

**CO-PO MAPPING:**

| CO No. | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | | 2 | 3 | 2 | | 2 | 2 | 3 |
| CO2 | 2 | 3 | | 3 | 3 | 2 | | 2 | 2 | 3 |
| CO3 | 3 | 2 | | 3 | 2 | 2 | | 2 | 2 | 3 |
| CO4 | 2 | 2 | | 2 | 2 | 2 | | 2 | 2 | 3 |
| Average | 2.25 | 2.5 | | 2.5 | 2.5 | 2 | | 2 | 2 | 3 |

**Note: The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**
**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions**
**(vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits ..etc.**

**KEY Competencies to be achieved by the student**

| S. No | Experiment Title | Competencies | Key Competency |
|---|---|---|---|
| 1 | Specific Gravity of fine and coarse aggregate | • Take weights of empty pycnometer, pycnometer with water and pycnometer with aggregate accurately<br>• Record the observations accurately<br>• Calculate the values correctly | • Take weights of empty pycnometer, pycnometer with water and pycnometer with aggregate accurately |
| 2 | Impact value of coarse aggregate | • Prepare of sample correctly<br>• Weigh the cup and aggregate accurately<br>• Count number of strokes accurately<br>• Weigh residue retained on 2.36 mm sieve correctly | |
| 3 | Crushing value of coarse aggregate | • Prepare of sample correctly<br>• Weigh the mould and aggregate accurately<br>• Apply the load at required rate and to the required period accurately<br>• Weigh residue retained on 2.36 mm sieve correctly | • Apply the load at required rate and to the required period accurately |

| | | | |
|---|---|---|---|
| 4 | Abrasion value of coarse aggregate | • Weigh the aggregate accurately<br>• Count the required number of rotations correctly<br>• Weigh residue retained on 1.70 mm sieve accurately | |
| 5 | Flakiness Index of coarse aggregate | • Arrangement of sieves in correct order<br>• Weighing the aggregate passing through thickness gauge correctly | |
| 6 | Elongation Index of coarse aggregate | • Arrange the sieves in correct order<br>• Weigh the aggregate retaining over length gauge correctly | |
| 7 | Slump cone test on concrete | • Weigh the material accurately<br>• Apply required no. of tampings for each layer of concrete<br>• Measure the subsidence accurately | • Measure the subsidence accurately |
| 8 | Compaction factor test on concrete | • Weigh the material accurately<br>• Weigh the mould and concrete accurately<br>• Calculate the compactor factor correctly | |
| 9 | Casting of Cement concrete cubes | • Weigh the material accurately<br>• Vibrate the concrete filled in moulds to the required time correctly<br>• Cure the demoulded cubes to the required period | • Weigh the material accurately<br>• Vibrate the concrete filled in moulds to the required time correctly |
| 10 | Testing of cement concrete cubes for compression | • Apply the load at required rate correctly<br>• Record the load at FAILURE accurately<br>• Calculate the compressive strength accurately | • Apply the load at required rate correctly |
| 11 | Split Tensile Strength of concrete | • Apply the load at required rate correctly<br>• Record the load at FAILURE accurately<br>• Calculate the split tensile strength accurately | • Apply the load at required rate correctly<br>• Calculate the split tensile strength accurately |
| 12 | Design mix of concrete proportion | • Calculate the proportions of material correctly<br>• Weigh the ingredients of concrete accurately as per design mix calculations | • Calculate the proportions of material correctly |

| | | | |
|---|---|---|---|
| 13 | Non-destructive tests on concrete | • Applying the load at required rate as per procedure correctly<br>• Calculating the strength of hardened concrete from graphs accurately | • Applying the load at required rate as per procedure correctly |
| 14 | Sieve Analysis – Classification of soil | • Arrangement of sieves in correct order<br>• Sieving the soil to the required time<br>• Weigh of residue in each sieve accurately | |
| 15 | Atterberg Limits | • Weigh the material accurately<br>• Prepare the soil sample and place in the mould correctly<br>• Count the blows correctly<br>• Record the readings accurately<br>• Draw the graphs accurately | |
| 16 | Field Density of soil(Sand Replacement Method) | • Calibrate the apparatus correctly<br>• Weigh the samples accurately<br>• Calculate the density accurately | • Calibrate the apparatus correctly<br>• Weigh the samples accurately |
| 17 | Proctor Compaction Test | • Weigh the soil correctly<br>• Measure the water accurately<br>• Apply required no. of blows of compaction accurately<br>• Record the observations correctly<br>• Draw graph correctly | • Weigh the soil correctly<br>• Measure the water accurately<br>• Draw graph correctly |

**COURSE CONTENT**

1. **Tests on aggregate**
    a. Specific Gravity of fine and coarse aggregate
    b. Impact value of coarse aggregate
    c. Crushing value of coarse aggregate
    d. Abrasion value of coarse aggregate
    e. Flakiness index of coarse aggregate
    f. Elongation index of coarse aggregate
2. **Tests on concrete**
    a. Workability test by Slump Cone Test
    b. Workability test by Compaction factor test
    c. Casting of Cement concrete cubes
    d. Testing of Cement concrete cubes for compression
    e. Split tensile strength of concrete
    f. Design mix of concrete proportion
3. **Non-destructive tests on concrete**
    a. Surface hardness of concrete by Rebound hammer test
    b. Ultrasonic Test
4. **Tests on Soil**
    a. Sieve analysis-classification of soil.
    b. Atterberg Limits
    c. Field density of soil by sand replacement method
    d. Proctor Compaction Test

**REFERENCE BOOKS:**


1. Concrete Technology, M.S. Shetty & A.K. Jain, S.CHAND Publication
2. Concrete Technology, M.L. Gambhir , McGrawHill Publications.
3. Soils Mechanics and Foundations, B.C. Punmia, Dr. Ashok K. Jain &Dr. Arun K. Jain, Laxmi Publications
4. Engineering Properties of soils and their measurement, Joseph E. Bowles, McGraw Hill Book Company.

**Communication Skills**

| Course Code | Course Title | No. of Periods/Week | Total No. of Periods | Marks for FA | Marks for SA |
|---|---|---|---|---|---|
| C-408 | Communication Skills | 3 | 45 | 40 | 60 |

| S. No. | Unit Title | No of Periods | COs Mapped |
|---|---|---|---|
| 1 | **Listening Skills** | 6 | CO1 |
| 2 | **Introducing Oneself** | 3 | CO1, CO2, CO3 |
| 3 | **Short Presentation (JAM)** | 6 | CO1, CO2, CO3 |
| 4 | **Group Discussion** | 6 | CO1, CO2, CO3 |
| 5 | **Preparing Resume with Cover Letter** | 3 | CO3 |
| 6 | **Interview Skills** | 9 | CO1, CO2, CO3 |
| 7 | **Presentation Skills** | 9 | CO1, CO2 |
| 8 | **Work place Etiquette** | 3 | CO1, CO2 |
| **Total Periods** | | **45** | |

| | |
|---|---|
| **Course Objectives** | To comprehend the features of communication needed for professional success and display the use of these competently |
| | To present ideas, opinions in group discussions and presentations on topics of general and technical interest |
| | To prepare for job selection processes |

| CO No. | Course Outcomes |
|---|---|
| CO1 | Interacts in academic and social situations by comprehending what is listened to when others speak. |
| CO2 | Demonstrates effective English communication skills while presenting ideas, opinions in group discussions and presentations on topics of general and technical interest. |
| CO3 | Exhibits workplace etiquette relevant in classroom situations for easy adaptation in professional setting in the future. |

**CO-PO Matrix**

| **Course Code**<br><br>**C-408** | **Course Title: English**<br><br>**Number of Course Outcomes: 4** | | | | **No. of Periods: 45** |
|---|---|---|---|---|---|
| POs | Mapped with CO No. | CO Periods Addressing PO in Column 1 | | Level of Mapping<br><br>(1,2,3) | Remarks |
| | | Number | Percentage % | | |
| PO1 | | Not directly applicable for Communication Skills Course however interactive activities that use content from science and technology relevant to the Programme taken up by the student shall be exploited for communication in the Course. | | | |
| PO2 | | | | | |
| PO3 | | | | | |
| PO4 | | | | | |
| PO5 | CO1, CO2, CO3 | 11 | 25% | 2 | >60%: Level 3<br><br>16 -59%: Level 2<br><br>Up to 15%: Level 1 |
| PO6 | CO1, CO2, CO3 | 27 | 60% | 3 | |
| PO7 | CO1, CO2, CO3 | 7 | 15% | 1 | |

Level 3 – Strongly Mapped
Level 2- Moderately Mapped
Level 1- Slightly Mapped

**Mapping Course Outcomes with Program Outcomes:**

| CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 |
|---|---|---|---|---|---|---|---|
| CO 1 | | | | | ✓ | ✓ | ✓ |
| CO 2 | | | | | ✓ | ✓ | ✓ |
| CO3 | | | | | ✓ | ✓ | ✓ |

**Blue Print for evaluation based on Course Outcomes for SA:**

**Note: Every Question based on CO has to be given marks for the following parameters of communication in the rubric.**

- Fluency and Coherence
- Lexical Resource (Vocabulary)
- Grammatical Range and Accuracy

***Rubric Descriptors 'Good/ Competent / Fair /Poor' for Communication**

| LEVEL OF COMPETENCE | Fluency and Coherence | Lexical Resource (Vocabulary) | Grammatical Range and Accuracy |
|---|---|---|---|
| GOOD (9-10*) | Speaks at length without noticeable effort or loss of coherence. May demonstrate language-related hesitation at times, or some repetition and/or self-correction. | Uses vocabulary resources flexibly during discussion. Uses paraphrase effectively. | Uses a range of complex structures with some flexibility. |
| | Uses a range of connectives and discourse markers with some flexibility. **Articulates and adapts to near naturalization.** | Uses some less common vocabulary and shows some awareness of style and collocation | Mostly produces error-free sentences. |
| COMPETENT (6-8) | Is willing to speak at length, though may lose coherence at times due to occasional repetition, self-correction or hesitation. | Has enough vocabulary to discuss topics and make meaning clear in spite of inappropriacies. | Uses a mix of simple and complex structures, but with limited flexibility. |
| | Uses a range of connectives and discourse markers but not always appropriately. | Generally paraphrases successfully | May make mistakes with complex structures though these rarely cause comprehension problems. |

| | | | |
|---|---|---|---|
| **FAIR (3-5)** | Tries to maintain a flow of speech but t uses repetition, self correction and/or slow speech to keep going. | Manages to talk about familiar and unfamiliar topics but uses vocabulary with limited flexibility. | Produces only basic sentence forms, however, errors persist. |
| | Produces simple speech fluently, but more complex communication causes fluency problems. | Attempts to use paraphrase but with mixed success. | Uses a limited range of more complex structures, but these usually contain errors and may cause some comprehension problems |
| **POOR (0 *-2)** | Speaks with long pauses. Pauses lengthy before most words. **Merely imitates** | Uses simple vocabulary to convey personal information | Attempts basic sentence forms but with limited success, or relies on apparently memorized utterances |
| | Has limited ability to link simple sentences | Has insufficient vocabulary for less familiar topics | Makes numerous errors except in memorized expressions |
| | Gives only simple responses and is frequently unable to convey basic message | Only produces isolated words or memorized utterances | Struggles to produce basic sentence forms |

***10 marks to be awarded only if competence level shows flawless expertise in English.**
***0 marks to be awarded when student shows incoherence and gives irrelevant responses.**

**Blue Print for evaluation based on Course Outcomes for SA of each student:**

**Note: Marks are awarded for each student as per the Rubric descriptors.**

| S. No. | Questions based on Course Outcomes | Periods Allocated for practical work | Marks Wise Distribution of Weightage | Marks allotment for each Student in the Rubric* | | | | Mapping of COs |
|---|---|---|---|---|---|---|---|---|
| | | | | Poor 0-2 | Fair 3-5 | Competent 6-8 | Good 9-10 | |
| 1 | Describe the given object in a minute | 6 | 10 | | | | | CO 2 |
| 2 | Exchange ideas/ views in a group discussion on _____ issue (academic, technical or social ) | 6 | 10 | | | | | CO1, CO 2 |
| 3 | Present your ideas /opinions on the given issue/ topic (individual to an audience) | 9 | 10 | | | | | CO1, CO2, CO 3 |
| 4 | Role play an imaginary work-place situation | 6 | 10 | | | | | CO1, CO2, CO 3 |
| 5 | Individual interaction with the Examiner duly submitting Resume ( Facing the Interview) – Introducing oneself and answering questions | 12 | 10 | | | | | CO1, CO2, CO 3 |
| 6 | *Listen to and comprehend any audio communication/ content | 6 | 10 | | | | | CO1, CO2, CO 3 |
| **TOTAL** | | **45** | **60** | | | | | |

***Listen to and comprehend the given audio content**: Giving the Students time to read the questions (Fill in the Blanks, Select from Alternatives, True or False, Table fill, etc.) in chunks before listening to audio inputs also played in chunks.

**Blue Print for evaluation based on Course Outcomes for Formative Assessment:**

**Note: Every Question based on CO has to be given marks for the following parameters in the rubric.**

- Fluency and Coherence
- Lexical Resource
- Grammatical Range and Accuracy

| S. No. | Questions based on Course Outcomes | Periods Allocated for practical work | Marks Wise Distribution of Weightage | Marks allotment for each Student in the Rubric* | | | | Mapping of COs |
|---|---|---|---|---|---|---|---|---|
| | | | | Poor 0-2 | Fair 3-5 | Competent 6-8 | Good 9-10 | |
| **Formative Assessment - 1** | | | | | | | | |
| 1 | Describe the given object in a minute | 3 | 10 | | | | | CO 2 |
| 2 | Exchange ideas/ views in a group discussion on _____ issue (academic, technical or social ) | 6 | 10 | | | | | CO1, CO 2 |
| 3 | Present your ideas /opinions on the given issue/ topic (individual to an audience) | 6 | 10 | | | | | CO1, CO2, CO 3 |
| 4 | *Listen to and comprehend any audio communication/ content | 3 | 10 | | | | | CO1, CO2, CO 3 |
| **Total** | | **18** | **40** | | | | | |
| **Formative Assessment -2** | | | | | | | | |
| 1 | Present your ideas /opinions on the given issue/ topic (individual to an audience) | 3 | 10 | | | | | |
| 2 | Role play an imaginary work-place situation | 6 | 10 | | | | | CO1, CO2, CO 3 |
| 3 | Individual interaction with the Examiner duly submitting Resume ( Facing the Interview) – Introducing oneself and answering questions | 15 | 10 | | | | | CO1, CO2, CO 3 |
| 4 | *Listen to and comprehend any audio communication/ content | 3 | 10 | | | | | CO1, CO2, CO 3 |
| **TOTAL** | | **27** | **40** | | | | | |

**Learning Outcomes**

1. **Listening Skills:**
    - 1.1 Listen to audio content (dialogues, interactions, speeches, short presentations) and answer questions based on them
    - 1.2 Infer meanings of words / phrases / sentences / after listening to audio content as mentioned above
2. **Introducing Oneself:**
    - 2.1 Prepare a grid different aspects for presentation about a person / oneself
    - 2.2 Present a 1 or 2 minute introduction of oneself for an audience
3. **Short Presentation:**
    - 3.1 Define an object
    - 3.2 Describe an object, phenomenon, event, people
    - 3.3 Speak on a topic randomly chosen
4. **Group Discussion:**
    - 4.1 Practice Group Discussion. Techniques
    - 4.2 Participate in group discussions
5. **Resume Writing and Cover Letter:**
    - 5.1 Prepare resumes of different sorts – one's own and others.
    - 5.2 Write an effective cover letter that goes with a resume
6. **Interview Skills:**
    - 6.1 Prepare a good Curriculum Vitae
    - 6.2 Exhibit acceptable (Greeting, Thanking, Answering questions with confidence)
7. **Presentation Skills:**
    - 7.1 Prepare Posters, Charts, PPT's on issue of general and technical interest
    - 7.2 Present one's ideas before an audience with confidence using audio visual aids and answer questions that are raised.
8. **Workplace Etiquette:**
    - 8.1 Show positive attitude & adaptability / appropriate body language to suit the work place
    - 8.2 Display basic of etiquette like politeness, good manners.

# SURVEYING – III PRACTICE

| Course code | Course Title | No. of periods/week | Total No. of periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-409 | Surveying-III Practice | 04 | 60 | 40 (30 for class exercises + 10 for survey camp) | 60 |

| S.No. | Major Topics | No. of Periods |
|---|---|---|
| 1 | Field Exercises using Total Station | 48 |
| 2 | Global Positioning System | 8 |
| 3 | Digitization of Maps | 4 |
| | Total | 60 |
| 4 | Survey camp for 3 days during 6 AM to 12 noon & 2PM to 5 PM on each day immediately after completion of exercises on Total station ( 25% of total sessional marks shall be allocated to this activity) | 3 days (additional instructional duration & NOT to be included in the above 60 periods) |

***Survey Camp: one of the following Surveying activity involving Total Station operations shall be allotted to one or two batches of the students:***

- ***a) Land Survey***
- ***b) Road Survey***
- ***c) Contour Survey***
- ***d) Other Surveys***

COURSE OBJECTIVES:

| **Upon completion of the course the student shall be able to** | | |
|---|---|---|
| **Course Objectives** | (i) | Develop knowledge about Modern surveying instruments & methods adopted to carry out Field Survey with a professional approach. |
| | (ii) | Develop skills in students in using Total Station, GPS and acquire knowledge in digitization of Maps |

**COURSE OUTCOMES:**

| | | | |
|---|---|---|---|
| **Course Outcomes** | CO1 | C-409.1 | Apply the knowledge of Total Station in different operations in Civil Engineering projects |
| | CO2 | C-409.2 | Perform precise operations/skills involved in using GPS and digitization of Maps. |

**LEARNING OUTCOMES:**

| | |
|---|---|
| **Learning Outcomes** | **1.0. Field Exercises using Total Station**<br>1.1 Study of component parts, accessories and functions Total Station, Initialization of Total Station over ground station and measure the distance between two given points, Measure area of given field.<br>1.2 Conduct traversing survey (closed Traverse).<br>1.3 Find the Height and width of an elevated object.<br>1.4 Determine the elevation of Instrument point by making observation to point with known elevation and measure multiple sets (rounds) of observations.<br>1.5 Perform a station setup on a known point by making observations to one or more back sight points and establish the position of an occupied point relative to a base line or a boundary line.<br>1.6 Mark or establish points, Lines and Arcs on the ground.<br>1.7 Mark Centre line of a building on the ground.<br>1.8 Conduct survey for L.S and C.S of a proposed road/canal/pipe line on the ground.<br>1.9 Perform post processing.<br>1.10 Plot contour map of an area using surfer software.<br><br>**2.0. Global Positioning System**<br>2.1 Identify the components and the functions of Global Positioning System.<br>2.2 Determine the Coordinates of various points on the ground.<br>2.3 Perform the linking the G.P.S data with Total Station.<br><br>**3.0. Digitization of Maps**<br>3.1 Study the concept of digitization.<br>3.2 Digitization of any given contour map Using the available soft wares<br>3.3 Digitization of given Town map and creating different layers for roads, railways, water supply lines and drainage lines etc., Using the available soft wares |

**PO-CO Mapping:**

| Course Code: CE-409 | Course Title: SURVEYING –III Practice<br>No.of COs: 02 | | | | No. of Periods: 60 |
|---|---|---|---|---|---|
| POs | Mapped with CO Nos. | CO periods addressing PO in Col.1 | | Level (1,2,3) | Remarks |
| | | No. | % | | |
| PO1 | CO1, CO2 | 6 | 10 | 1 | >40% Level 3 (Highly Addressed) |
| PO2 | CO1, CO2 | 6 | 10 | 1 | |
| PO3 | CO1, CO2 | 24 | 43 | 3 | 25% to 40% Level 2 (Moderately Addressed) |
| PO4 | CO1, CO2 | 14 | 25 | 2 | |
| PO5 | CO1, CO2 | 5 | 9 | 1 | 5% to 25% Level 1 (Low Addressed) |
| PO6 | CO1, CO2 | 5 | 9 | 1 | |
| PO7 | | | | | <5% Not Addressed |

**CO-PO Mapping:**

| CO No. | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | 2 | 3 |
| CO2 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 3 |
| Average | 2 | 2.5 | 2.5 | 2.5 | 2 | 2.5 | 2 | 3 | 2 | 3 |

**Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**
**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions**
**(vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits ..etc.**

**COURSE CONTENT**

**1.0 Field Exercises using Total Station**

a) Study of component parts, accessories and functions Total Station, Initialization of Total Station over ground station and measure the distance between two given points, Measure area of given field.
b) Conduct traversing survey (closed Traverse).
c) To find Height and width of an elevated object.
d) To determine the elevation of Instrument point by making observation to point with known elevation, to measure multiple sets (rounds) of observations.

e) To perform a station setup on a known point by making observations to one or more back sight points and to establish the position of an occupied point relative to a base line or a boundary line.
f) To mark or establish points, Lines and Arcs on the ground.
g) To mark Centre line of a building on the ground.
h) L.S and C.S of proposed road/canal/pipe line on the ground.
i) Understand post processing.
j) To plot contour map of an area using surfer software.

**2.0 Global Positioning System**

a) Identifies the components and the functions of Global Positioning System.
b) Determines the Coordinates of various points on the ground.
c) Linking the G.P.S data with Total Station.

**3.0 Digitization of Maps**

a) Study the concept of digitization.
b) Digitization of any given contour map Using the available soft wares
c) Digitization of given Town map and creating different layers for roads, railways, water supply lines and drainage lines etc., Using the available soft wares

**KEY competencies to be achieved by the student**

| S.NO. | Experiment Title | Key Competency |
|---|---|---|
| 1 | Field Exercises using Total Station<br>a) Ex 1.1<br>b) Ex 1.2<br>c) Ex 1.3<br>d) Ex 1.4<br>e) Ex 1.5<br>f) Ex 1.6<br>g) Ex 1.7<br>h) Ex 1.8<br>i) Ex 1.9 | • Places total station on tripod, checks batteries and switches on total station<br>• Centering of total station over a given point and sighting reflecting prism to measure distance<br>• Measure area of given field<br>• Conduct traversing survey (closed Traverse) and gets plotting<br>• Finds Height and width of an elevated object<br>• Finds the elevation of Instrument point by making observation to point with known elevation<br>• Understands errors by taking multiple sets (rounds) of observations<br>• Knows station setup on a known point by making observations to one or more back sight points<br>• Establish the position of an occupied point relative to a base line or a boundary line<br>• Establish points, Lines and Arcs on the ground<br>• Locates Centre line of a building on the ground<br>• Collects data for L.S and C.S of proposed road/canal/pipe line on the ground<br>• Understand post processing<br>• Plots contour map of an area using SURFER software |
| 2 | Global Positioning System<br>a) Ex 2.1 | • Identifies the parts and the functions and learns operating GPS |

| | | |
|---|---|---|
| | b) Ex 2.2<br><br>c) Ex 2.3 | • Determines the Coordinates of various points on the ground<br>• Linking the G.P.S data with Total Station |
| 3 | Digitization of Maps<br>a) Ex 3.1<br><br>b) Ex 3.2<br><br>c) Ex 3.3 | • Understands software<br>• Digitizes of any given contour map using available software.<br>• Digitizes of given Town map and creating different layers for roads, railways, water supply lines and drainage lines etc., Using the available software. |

## CAD PRACTICE-I

| Course code | Course Title | No. of periods/week | Total No. of periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-410 | CAD Practice-I | 06 | 90 | 40 | 60 |

| S. No. | CHAPTER/UNIT TITLE | No. of Periods | COs Mapped |
|---|---|---|---|
| 1. | Introduction to Computer Aided Drafting | 12 | CO1 |
| 2. | Practice on CAD software | 24 | CO2 |
| 3. | Preparation of 2-D drawings for residential buildings using CAD Software as per building bye laws in Panchayat / Municipality/Corporation | 36 | CO3 |
| 4 | Preparation of 3-D drawings using CAD software | 18 | CO4 |
| | Total | 90 | |

**COURSE OBJECTIVES:**

| | | |
|---|---|---|
| **Course Objectives** | (i) | Know the importance of Computer Aided Drafting (CAD) and to Practice CAD, drawing editor and to perform different operations using CAD Commands |
| | (ii) | Prepare drawings of different components of building, site plans, single storeyed buildings, line drawings of public & industrial buildings, working drawings by using CAD 2D and 3D. |

**COURSE OUTCOMES:**

| | | | |
|---|---|---|---|
| **Course Outcomes** | CO1 | C-410.1 | Dimensions a given drawing using standard notation and desired system of dimensioning, Practices drawing different components of buildings. |
| | CO2 | C-410.2 | Practices drawing plan, elevation and section and site plan of residential buildings, and framed structures as per local bye laws |
| | CO3 | C-410.3 | Practices drawings to be submitted to Panchayat/Municipality/Corporation for Residential and Commercial building approval |
| | CO4 | C-410.4 | Practices 3-D drawings using CAD software |

**LEARNING OUTCOMES:`**

| | |
|---|---|
| **Learning Outcomes** | **1.0 INTRODUCTION TO COMPUTER AIDED DRAFTING**<br>• State the applications and advantages of CAD<br>• State the advantages of CAD<br>• State the features of CAD as drafting package<br>• State the hardware requirements to run CAD<br><br>**2.0 PRACTICE ON CAD SOFTWARE**<br>• Study the drawing editor screen.<br>• Practice the methods of selecting/entering commands to start new drawing accessing CAD commands by selecting from menus, tool bars and entering Commands on command line.<br>• Set the limits of the drawing to get the needed working area.<br>• Practice the 'setting commands' Grid, Snap, & Ortho Commands.<br>• Practice 'Draw commands'- point, line, pline, rectangle, circle, tangent, ellipse, arc, polygon and spline.<br>• Dimension the given figures.<br>• Practice 'modify commands' – erase, copy, mirror, move, rotate, scale, stretch, trim, extend, break, chamfer, fillet, explode, Pedit, Mledit.<br>• Practice 'construct commands' – offset, array, Divide measure.<br>• Practice 'edit commands' – Undo, Redo, Oops, Copy Clip, Paste Clip, Del.<br>• Practice 'view commands' – Redraw, Regen, Zoom, Pan.<br>• Practice 'Hatch commands' – Bhatch, Hatch.<br>• Practice 'insert commands' – Block, Wblock, Insert, Minsert.<br>• Practice dividing a line into number of segments.<br>• Practice drawing external/internal common tangents for circles of same/different radii.<br>• Practice drawing external/internal common arcs for circles of same/different radii.<br>• Practice construction of ellipse, parabola, hyperbola, cycloid, and helix<br><br>**3.0 Practice 2-D drawings of residential buildings using CAD Software**<br>• Practice conventional signs used in civil engineering.<br>• Practice drawing elevation of panelled door partly panelled and partly glazed door/window shutter.<br>• Practice drawing cross section of Load bearing wall showing different components.<br>• Practice drawing Plan, Elevation, section and site plan of one roomed building.<br>• Practice drawing Plan, Elevation, section and site plan of 2BHK building. |

| | |
|---|---|
| | • Practice drawing Double line diagram of primary school building.<br>• Practice drawing Plan of Rural Hospital.<br>• Practice drawing typical floor Plan of Apartment<br><br>**4.0 Preparation of 3-D drawings using CAD Software**<br><br>• Practice 3D commands. – View commands – solids command – solid editing/modify commands.<br>• Draw 3-D view of different simple objects.<br>• Draw 3D view of Isolated Column footing.<br>• Draw 3D view of wall foundation.<br>• Draw Single roomed building in 3D.<br>• Draw double roomed building in 3D. |

**KEY competencies to be achieved by the student**

| S.NO. | Experiment Title | Key Competency |
|---|---|---|
| 1. | Introduction to computer | • Open/close CAD program<br>• Understands CAD Graphic User Interface(GUI) and various toolbars |
| 2 | Practice on CAD software Geometric Constructions | • Practices the methods of selecting/entering commands<br>• Sets the limits of the drawing<br>• Learns Draw commands<br>• Learns Modify commands<br>• Learns Edit commands<br>• Learns View commands<br>• Learns Hatch commands<br>• Learns Dimensioning Commands<br>• Draws simple geometrical shapes like circles, tangents |
| 3 | Preparation of 2-D drawings using CAD Software | • Draws 2-D drawings<br>• Practice conventional signs used in civil engineering.<br>• Draws elevation of panelled door partly panelled and partly glazed door/window shutter.<br>• Draws cross section of Load bearing wall showing different components.<br>• Draws Plan, Elevation, section and site plan of one roomed building.<br>• Draws Plan, Elevation, section and site plan of 2BHK building.<br>• Draws Double line diagram of primary |

| | | |
|---|---|---|
| | | school building.<br>• Draws Plan of Rural Hospital.<br>• Draws typical floor Plan of Apartment |
| 4 | Preparation of 3-D drawings using CAD software | • Learns 3-D commands<br>• Draws simple 3-D elements<br>• Draws 3-D views of Isolated Column footing<br>• Draws 3-D views of wall foundation<br>• Draws 3-D Views Single roomed and double roomed building in 3D |

**PO-CO MAPPING:**

| **Course Code : C-410** | **Course Title: CAD PRACTICE-I<br>Number of COs: 04** | | | | **No. of Periods: 90** |
|---|---|---|---|---|---|
| **POs** | **Mapped with CO No.** | **CO Periods addressing PO in Column 1** | | **Level (1,2,3)** | **Remarks** |
| | | **No** | **%** | | |
| PO1 | CO1, CO2, CO3, CO4 | 23 | 26 | 2 | >40% Level 3 (Highly Addressed) |
| PO2 | CO1, CO2, CO3, CO4 | 10 | 11 | 1 | |
| PO3 | CO1, CO2, CO3, CO4 | 10 | 11 | 1 | 25% to 40% Level 2 (Moderately Addressed) |
| PO4 | CO1, CO2, CO3, CO4 | 36 | 40 | 3 | |
| PO5 | CO1, CO2, CO3, CO4 | 6 | 7 | 1 | 5% to 25% Level 1 (Low Addressed) |
| PO6 | | | | | |
| PO7 | CO1, CO2, CO3, CO4 | 5 | 5 | 1 | <5% Not Addressed |

**CO-PO MAPPING:**

| **CO No.** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PSO1** | **PSO2** | **PSO3** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 3 | 3 | 2 | 3 | | 2 | 2 | 2 | 3 |
| **CO2** | 2 | 3 | 2 | 3 | 3 | | 2 | 2 | 2 | 3 |
| **CO3** | 3 | 2 | 2 | 3 | 2 | | 2 | 2 | 2 | 3 |
| **CO4** | 2 | 2 | 2 | 2 | 2 | | 2 | 2 | 2 | 3 |
| **Average** | 2.25 | 2.5 | 2.25 | 2.5 | 2.5 | | 2 | 2 | 2 | 3 |

**Note: The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**

**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions**
**(vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits ..etc.**

**COURSE CONTENT**

**1.0 Introduction to computer aided drafting (CAD)**

a) Computer graphics
b) Definition of CAD
c) Applications of CAD
d) Advantages of CAD
e) Introduction to CAD as drafting package

**2.0 Practice on CAD**

a) Study of drawing editor screen
b) List the methods to access CAD commands.
c) Practice of setting up of drawing area using utility commands, and using setting commands.
d) Practice entity draw commands.
e) Draw the given geometrical figures using draw commands.
f) Practice of Modify commands.
g) Practice of construct commands.
h) Practice of edit commands
i) Practice of view commands.
j) Practice of Hatch commands.
k) Practice of insert commands.
l) Dimension the figures using dimensioning commands.
m) Practice of Print/Plot commands
n) Divide a line into number of segments.
o) Draw an external/internal common tangent for two given circles of same/different radii.
p) Draw external/internal arcs for two given circles of same/different radii.
q) Construct ellipse, parabola, hyperbola, cycloid, and helix.

**3.0 Preparation of 2-D drawings using CAD Software**

Draw conventional signs, symbols used in civil engineering drawing.

a) Draw the elevation of fully panelled door, partly glazed and partly panelled door/window shutter.
b) Draw the section of a load bearing wall.
c) Prepare Building Drawing – One roomed building with site plan.
d) Prepare Building Drawing – 2BHK building with site plan.
e) Prepare plan of primary school Building.
f) Prepare Plan of Rural Hospital building.
g) Prepare a typical floor plan of Apartment consisting of G+5 floors.

**4.0 Preparation of 3-D drawings using CAD Software**

a) Practice 3D commands. – View commands – solids command – solid editing/modify commands.
b) Draw 3-D view of different simple objects.
c) Draw 3D view of Isolated Column footing.
d) Draw 3D view of wall foundation.
e) Draw Single roomed building in 3D.
f) Draw double roomed building in 3D.

**REFERENCE BOOKS:**

1. Drafting and Design (Engineering Drawing Using Manual and CAD Techniques), Kicklighter & Brown – Goodheart-Willcox Publisher

# V SEMESTER

**DIPLOMA IN CIVIL ENGINEERING**
**SCHEME OF INSTRUCTION AND MODEL BLUE PRINT FOR EVALUATION**
**CURRICULUM-2020**

**FIFTH SEMESTER**

| Sub Code | Name of the Subject | Instruction Periods/Week | | Total Periods Per Year | Scheme Of Examination | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | | Duration (hrs) | Sessional Marks | End Exam Marks | Total Marks |
| **THEORY** | | | | | | | | |
| **C-501** | Steel Structures | 4 | | 60 | 3 | 20 | 80 | 100 |
| **C-502** | Environmental Engineering | 5 | | 75 | 3 | 20 | 80 | 100 |
| **C-503** | Quantity Surveying-II | 4 | | 60 | 3 | 20 | 80 | 100 |
| **C-504** | Construction Failures, Repairs & Maintenance | 3 | | 45 | 3 | 20 | 80 | 100 |
| **C-505** | Quality Control and Safety in Construction | 4 | | 60 | 3 | 20 | 80 | 100 |
| **C-506** | Construction Management & Entrepreneurship | 3 | | 45 | 3 | 20 | 80 | 100 |
| **PRACTICAL** | | | | | | | | |
| **C-507** | Structural Engineering Drawing | | 3 | 45 | 3 | 40 | 60 | 100 |
| **C-508** | Life Skills | | 3 | 45 | 3 | 40 | 60 | 100 |
| **C-509** | Field Practices | | 7 | 105 | 3 | 40 | 60 | 100 |
| **C-510** | CAD Practice-II | | 6 | 90 | 3 | 40 | 60 | 100 |
| | **Total** | **23** | **19** | **630** | | **280** | **720** | **1000** |

# STEEL STRUCTURES

| Course code | Course title | No. Of period/week | Total no. Of periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-501 | Steel Structures | 04 | 60 | 20 | 80 |

| S.No. | Major Topics | No. Of Periods | Cos Mapped |
|---|---|---|---|
| 1. | Introduction and Fundamentals of Limit State Design of Steel structures | 04 | CO1 |
| 2. | Design of fillet welded joints | 10 | CO2 |
| 3. | Design of Tension members | 10 | CO3 |
| 4. | Design of Compression members, Columns &Column bases | 17 | CO4 |
| 5. | Design of Beams | 15 | CO5 |
| 6. | Roof Trusses | 4 | CO5 |
| | Total | 60 | |

**COURSE OBJECTIVES:**

| Upon completion of the course the student shall be able to | | |
|---|---|---|
| **Course Objectives** | (i) | Understand the fundamentals of Limit state design of steel structures and design aspects of fillet welded joint. |
| | (ii) | Design tension members, compression members and flexural members by following IS Codal provisions. |

**COURSE OUTCOMES:**

| | | | |
|---|---|---|---|
| **Course Outcomes** | CO 1 | C-501.1 | Explain the fundamentals of limit state design of steel structures. |
| | CO 2 | C-501.2 | Design Fillet Welded Joints |
| | CO 3 | C-501.3 | Design of Tension Members in Steel Structures |
| | CO 4 | C-501.4 | Design Compression Members, Columns and Column bases |
| | CO 5 | C-501.5 | Design Steel Beams and State different types of roof trusses and their suitability |

**LEARNING OUTCOMES:**

| | |
|---|---|
| **Learning Outcomes** | **1.0 Introduction and fundamentals of limit state design of steel structures**<br>1.1 State common types of steel structures,their merits and demerits.<br>1.2 List the loads considered in the design of steel structures as per I.S:875-1987 and describe them<br>1.3 Understand the code of practice I.S. 800-2007<br>1.4 List physical and mechanical properties of structural steel.<br>1.5 Sketch different types of rolled steel sections and explain its classification based on their cross sections.<br>1.6 List types of elements.<br>1.7 Explain the concept of Limit State Design, define 'limit state' and state the types.<br>1.8 Define Characteristic action, Design action and Design strength.<br>1.9 State the partial safety factor values for loads in limit state of strength and serviceability and for materials in limit state.<br>1.10 State the deflection limits for Simply supported beam, Cantilever beam and Purlins<br><br>**2.0 Design of Fillet Welded Joints**<br>2.1 State different types of joints.<br>2.2 Differentiate the welded joints and Riveted joints<br>2.3 Sketch the different forms of welded joints.<br>2.4 Explain the features of a fillet welded joint.<br>2.5 State stresses in welds as per I.S.800-2007.<br>2.6 State formula for design strength of a fillet welded joint.<br>2.7 Calculate the design strength of a fillet welded joint.<br>2.8 Design a fillet welded joint for a given load, thickness of a plate and permissible stresses as per code.Design a fillet welded joint for a single angle connected to the gussetplate by fillet welds along the sides and at ends carrying axial loads.Design a fillet welded joint for a double angle connected to the gussetplate by fillet welds along the sides and at ends carrying axial loads.<br><br>**3.0 Design of Tension Members**<br>3.1 Define ' tie'<br>3.2 State the applications of tension members.<br>3.3 Sketch different forms of tension members and understand their behaviour of tension members.<br>3.4 State and describe different modes of failures of tension members with sketches<br>3.5 State the maximum values of effective slenderness ratios as per code.<br>3.6 Determine the net effective area of single angle connected to gusset plate by welding.<br>3.7 Determine the design strength due to yielding of gross section, rupture of critical section and block shear failure of a single angle connected by welding<br>3.8 Understand design procedure of tension members. Design a single angle tension member connected by welding only. |

| | |
|---|---|
| | **4.0 Design of Compression Members, Columns and Column bases**<br>4.1 Understand, State and sketch different types of compression members (like column, strut)<br>4.2 Sketch different forms of compression members and understand and Their behaviour and state the classification of cross sections.<br>4.3 Define the terms 1. Least radius of gyration and 2. Slenderness Ratio and distinguish between actual length and effective length and also state effective lengths to be used for different end conditions.<br>4.2 Understand buckling class of cross section based on Imperfection factor, stress reduction factor and column buckling curves and state maximum values of effective slenderness ratios as per code<br>4.3 Understand the design compressive stress for different column buckling Classes, Determine the design strength of compression members<br>4.4 Understand design procedure of compression members and design of columns with I sections and built-up channel sections.<br>4.5 Understand design details , effective sectional area , codal provisions for angle struts and design single angle and double angle struts.<br>4.6 Understand codal provisions of lacing and battening systems for built-up columns.<br>4.7 Design a slab base along with a cement concrete pedestal and also design the welded connection.<br>**5.0 Design of Steel Beams**<br>5.1 Understand the concept of limit state design of beams , Define the terms: Elastic moment of resistance, Plastic moment of resistance, Elastic section modulus, Plastic section modulus and Shape factor.<br>5.2 Determine the shape factor values for rectangular, Tee and I-sections.<br>5.3 Understand the behaviour of steel beams, Classify beams based on lateral restraint of compression flange.<br>5.4 Determine the design strength in bending (flexure) and in shear of laterally supported beams and list the factors affecting lateral stability and influence of type of loading.<br>5.5 Distinguish between web buckling and web crippling and understand the failure of beams by flexural yielding and list the types of failure of beams by flexural yielding<br>5.6 Understand laterally supported beam, holes in tension zone, shear lag effects and design bending strength.<br>5.7 Understand laterally unsupported beam, lateral torsional buckling of beams (theoretical concept only – no problems) and explain effective length of compression flanges.<br>5.8 Understand concept of shear in beams and resistance to shear buckling., shear buckling design methods like Simple post critical method and Tension field method and also understand the design of simple beams with solid webs.<br>5.9 Understand component parts of plate girders with sketches and describe different types of Stiffeners with their suitability.<br>5.10 Design laterally supported simply supported beam considering all codal requirements. |

| | |
|---|---|
| | **6.0 Roof Trusses**<br><br>6.1 List types of trusses viz., Plane trusses and Space trusses.<br>6.2 Understand the situations where roof trusses are used.<br>6.3 Sketch different types of roof trusses with their suitability for a given span.<br>6.4 Sketch a roof truss and name the component parts.<br>6.5 Understand the configuration of trusses like Pitched roof and Parallel chord trapezoidal trusses.<br>6.6 Understand cross sections of truss members.<br>6.7 Understand the loads on roof trusses as per I.S – 875-1987<br>6.8 Calculate the live load on roof covering and live load on truss. |

**PO-CO Mapping:**

| **Course Code : C-501** | **Course Title: Steel Structures**<br><br>**Number of Cos: 05** | | | | **No. Of Periods: 60** |
|---|---|---|---|---|---|
| **PO #** | **Mapped with CO #** | **CO Periods addressing PO in Column 1** | | **Level (1,2,3)** | **Remarks** |
| | | **No** | **%** | | |
| PO1 | CO1, CO2, CO3, CO4, CO5 | 24 | 40 | 3 | **> 40% Level 3 Highly addressed**<br><br>**25% to 40% Level 2 Moderately addressed**<br><br>**5 to 25% Level 1 Low addressed** |
| PO2 | CO1,CO2,CO3, CO4, CO5 | 24 | 40 | 3 | |
| PO3 | CO2,CO3,CO4,CO5 | 6 | 10 | 1 | |
| PO4 | | | | | |
| PO5 | CO2,CO3,CO4,CO5 | 6 | 10 | 1 | |
| PO6 | | | | | |
| PO7 | | | | | |

**CO-PO Mapping:**

| CO No. | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 3 | | | | 1 | 3 | 3 | 3 |
| CO2 | 2 | 3 | 2 | | | | 1 | 3 | 3 | 3 |
| CO3 | 2 | 3 | 2 | | | | 1 | 3 | 3 | 3 |
| CO4 | 2 | 3 | 1 | | | | 1 | 3 | 3 | 3 |
| CO5 | 3 | 2 | 2 | | | | | | | |
| Average | 2.4 | 2.6 | 2 | | | | 1 | 3 | 3 | 3 |

**Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**

**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz**

**(vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc**

**COURSE CONTENT**

1. **Introduction and fundamentals of limit state design of steel structures**

   Merits and demerits of steel structures – Loads considered in the design of steel structures as per I.S:875 -1987 – Introduction to I.S. 800-2007 – Mechanical properties of structural steel – yield stress ($f_y$), ultimate tensile stress ($f_u$) and maximum percent elongation (table -1 of IS:800-2007) – Standard structural sections – Classification of cross sections – class 1(plastic) class2(compact) class3(semi compact) and class4(slender) – types of elements – internal elements, outstands and tapered elements – Concept of Limit State Design – limit state of strength – limit state of serviceability – classification of actions – strength – partial safety factors for loads and materials – deflection limits.

2. **Design of Fillet Welded Joints**

   Different types of joints – lap joints – butt joints – Differentiation of welded joints and riveted joints – Different forms of welded joints – sketches of fillet and butt weld joints – Fillet welded joint – detailed sketch showing the component parts – Stresses in welds as per I.S.800-2007 – Codal requirements of welds and welding – Problems on calculation of strength of a fillet welded joint – Design of fillet welded joint for a given load, thickness of a plate and permissible stresses as per code – Design of fillet welded joint for single or double angles carrying axial loads.

3. **Design of Tension Members**

   Introduction – different forms of tension members – Behaviour of tension members – Different modes of failures – gross section yielding, net Section rupture and block shear failure – Maximum values of effective slenderness ratios as per code – Calculation of net effective sectional area of single angle with welded connection only – Calculation of the design strength due to yielding of gross section, rupture of critical section and block shear – problems on single angle with welded connection only – Design procedure of tension members – Problems on design of tension members single angle with welded connection only.

4. **Analysis and design of Compression Members, columns and column Basis**
   Introduction – different forms of compression members – Behaviour of compression members – classification of cross sections – class 1 (plastic), class2 (compact), class3 (semi compact) and class4 (slender) – Effective lengths to be used for different end conditions – table 11 of I.S:800 – Buckling class of cross section – imperfection factor and stress reduction factor for different buckling classes – column buckling curves – Maximum values of effective slenderness ratios as per code – design compressive stress for different column buckling classes – Calculation of design strength of compression members – problems – Design procedure of compression members – problems on simple sections only (no built-up sections) – Design details – effective sectional area – codal provisions for angle struts – single angle and double angle – discontinuous and continuous struts –Codal provisions of single / double lacing and battening for built-up columns (no problems) – Design of slab base along with a cement concrete pedestal, design of welded connection of base plate and column – problems.

5. **Analysis and design of Steel Beams**
   Concept of limit state design of beams – shape factor and plastic properties of beams – Problems on shape factor – Behaviour of steel beams – design strength in bending (flexure) – Factors affecting lateral stability – influence of type of loading – web buckling and web crippling – Beams failure by flexural yielding – Laterally supported beam – holes in tension zone – shear lag effects – design bending strength – lateral torsional buckling of beams – (theoretical concept only – no problems) – Effective length of compression flanges - Concept of shear in beams – resistance to shear buckling – Shear buckling design methods – simple post critical method – tension field method – Design of laterally supported simple beams with solid webs – Component parts of plate girders with sketches – brief description of different types of stiffeners - Design of laterally supported simply supported beam considering all codal requirements.

6. **Design of Roof Trusses**
   Types of trusses – plane trusses, space trusses – Sketches of different roof trusses with their suitability for a given span – Cross sections of truss members – Loads on roof trusses as per I.S. 875 -1987 –Determination of live load given pitch of the truss.

**REFERENCE BOOKS:**


1. IS 800-2007 –Indian Standard General construction in steel — code of practice
2. Design of Steel Structure by N Subramanian, Oxford University Press, New Delhi.
3. Limit state design of steel structures by S K Duggal, Tata McGraw Hill Education, New Delhi
4. Fundamentals of structural steel design M L Gambhir, Tata McGraw Hill Education Private Limited, New Delhi
5. Steel Structures: Design and Practice by N Subramanian,Oxford Publishers, New Delhi
6. Design of steel structure by Limit State Method as per IS 800- 2007 by Bhavikatti S S, I.K. International Publishing House, New Delhi
7. Limit state design of Steel Structure by Ramchandra & Gehlot, Scientific Publishers, Pune.
8. Teaching Resource Material : http://www.steel-insdag.org

**MODEL BLUE PRINT**

| S. No | Major Topics | No. Of periods | Weightage of marks | Marks wise Distribution of Weightage | | | | Question wise Distribution of Weightage | | | | Cos Mapped |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | R | U | Ap | An | R | U | Ap | An | |
| 1. | Introduction and Fundamentals of Limit State Design of Steel structures | 04 | 03 | 03 | -- | -- | -- | 1 | - | - | -- | CO1 |
| 2. | Design of fillet welded joints | 10 | 14 | 03 | 03 | 08 | -- | 1 | 1 | 1 | -- | CO2 |
| 3. | Design of Tension members | 10 | 11 | 03 | -- | 08 | -- | 1 | -- | 1 | -- | CO3 |
| 4. | Design of Compression members, Columns &Column bases | 17 | 25 | 06 | 03 | 16 | -- | 2 | 1 | 2 | -- | CO4 |
| 5. | Design of Beams | 15 | 14 | 03 | 03 | 08 | -- | 1 | 1 | 1 | -- | CO5 |
| 6. | Roof trusses | 4 | 03 | 03 | -- | -- | -- | 1 | -- | -- | -- | CO5 |
| | **Higher order question from any or combination of 3,4&5 Chapters** | -- | 10 | -- | -- | -- | 10 | -- | -- | -- | 1 | CO3, CO4 & CO5 |
| | Total | 60 | 80 | 21 | 09 | 40 | 10 | 7 | 3 | 5 | 1 | |

**Table specifying the scope of syllabus to be covered for Unit Test-I & Unit Test-II**

| Unit Test | Learning Outcomes to be covered |
|---|---|
| Unit Test – I | From 1.1 to 3.10 |
| Unit Test – II | From 4.1 to 6.8 |

**Model Paper for Unit Test-I**

**State Board of Technical Education and Training, A.P.**

**Diploma in Civil Engineering (DCE)**

**Fifth Semester: C-501 STEEL STRUCTURES**

**Time: 90 Minutes** **Unit Test –I** **Maximum Marks : 40**

**PART- A** **16 Marks**

**Instructions:**

**(i)Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1. (a) The value of poisons ratio of steel is ___ (CO1)

   (b) Effective throat thickness of fillet welded joint is _____times size of weld. (CO2)

   (c) Design strength of tension member due to gross section yielding is_____ (CO3)

   (d) Shear lag effect increases the effectiveness of tension member. (TRUE/FALSE) (CO3)

2. State the advantages and disadvantages of steel structures. (CO1)

3. Draw the cross section of fillet welded joint mentioning salient features. (CO2)

4. Calculate the gross cross sectional area of a tie member ISA 90x60x8mm if the longer leg is connected to gusset plate by fillet welded joint. (CO3)

5. What is meant by shear lag. (CO3)

**PART- B** **3 x 8 = 24 Marks**

**Instructions :**

**(i) Answer all questions**

**(ii) Each question carries EIGHT marks**

**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A) An angle ISA 90x60x8mm carrying an axial tension of 200kN is connected to a gusset plate of 12mm thick. Design the fillet welded joint when the weld is provided along the sides only. Take permissible shear stress in the weld as 108Mpa. Fy=250Mpa (CO2)

(OR)

(B) A tie member of a roof truss consists of ISA 110x110x10mm carrying factored pull of 330kN connected to a gusset plate through its longer leg. Design the fillet welded joint using end and side welds. Take $f_y$=330N/mm$^2$, $f_u$=410N/mm$^2$. (CO2)

7. (A) A tie member of a roof truss consists of 2nos ISA 90x60x10mm subjected to a pull of 500kN. The angles are connected to a gusset plate of 10mm thick. Design the welded joint with ultimate shear stress in the weld as 330Mpa and yield stress of steel as 250 Mpa. Provide end and side welds. (CO2)

(OR)

(B) Determine the design tensile strength of single angle, ISA 100x65x10mm when its longer leg is connected to 10mm thick gusset plate by 6mm sixe fillet welds. The length of weld is 150mm. Take $f_y$=250N/mm$^2$, $f_u$=410N/mm$^2$. (CO3)

8. (A) Determine the tensile strength of a single angle tension member ISA 90x60x6mm connected to a gusset plate by 4mm sixe fillet weld. The length of the weld is 300mm. Take $f_y$=250N/mm$^2$, $f_u$=410N/mm$^2$. (CO3)

(OR)

(B) Design a single angle tension member to carry a factored tension of 250kN, if the yield and ultimate stresses in steel are 250Mpa and 410 Mpa respectively. The effective length of the weld is 250mm. The length of the member is 3.0m. (CO3)

oOo

**Model Paper for Unit Test-II:**

**State Board of Technical Education and Training, A.P.**

**Diploma in Civil Engineering (DCE)**

**Fifth Semester :C-501 STEEL STRUCTURES**

Time: 90 Minutes Unit Test –II Maximum Marks : 40

**PART- A** **16 Marks**

***Instructions :***

*(i) Answer all questions*

*(ii) First question carries FOUR marks, each question of remaining carries THREE marks.*

1 (a) The compression members in a truss are called ___ (CO5)

(b) Lacings are provided in which members_____ (CO4)

(c) In a steel beam I section, the shear force is completely taken by flanges only (True/False) (CO4)

(d) The tension members in a truss are called 'Structs'. (TRUE/FALSE) (CO5)

2. Define (a) Column (b) Strut. (CO4)

3. Define effective length of column. Give the values of effective length for any two cases of end conditions of column as per IS800. (CO4)

4. Define shape factor. Mention the value of shape factor rectangular and circular sections. (CO5)

5. Determine the live load on the truss of a roofing system having angle of roofing 24 degrees. (CO5)

**PART- B** **3 x 8 = 24 Marks**

***Instructions :***

(i) Answer all questions
(ii) Each question carries EIGHT marks
(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

6. (A) Determine the design load carrying capacity of the column ISHB300@577N/m, if the length of the column is 3m and both ends are pinned. Take $f_y$=250N/mm$^2$, $f_u$=410N/mm$^2$ and E = 2x10$^5$ N/mm$^2$. (CO4)

(OR)

(B) A built-up column is made up of ISHB300@618N/m with two cover plates 300x18mm one on each flange connected by fillet welds along the length of flanges. The effective length of the column is 3.0m and yield stress of steel is 250 N/mm$^2$. (CO4)

7. (A) Design a slab base for a column ISHB250@537N/m carrying an axial load of 600kN. Yield stress of steel is 250Mpa and M20 grade concrete pedestal is used. Also design the concrete pedestal. Assume SBC of the soil 150 kN/m$^2$.

(CO4)

(OR)

(B) Determine the design compressive strength of single angle discontinuous strut ISA 125x95x10mm, length 2.5m. The longer leg is connected to the gusset plate by fillet weld. Gusset fixity may be assumed as fixed. Take $f_y$=250N/mm$^2$ and E = 2x10$^5$ N/mm$^2$. (CO4)

8. (A) Calculate shape factor of symmetrical I-Section with flanges 250x15mm and web 12x275mm. (CO5)

(OR)

(B) An ISLB300@369N/m is subjected to factored bending moment of 140kN-m. Check the adequacy of beam in bending. Take $f_y$=330N/mm$^2$. The compression flange of the beam is laterally restrained. (CO5)

**Model Paper for End Examination**

**MODEL PAPER – BOARD DIPLOMA EXAMINATION, (C–20)**

**DCE—FIFTH SEMESTER EXAMINATION**

**STEEL STRUCTURES (C-501)**

**Time: 3 hours] [Total Marks: 80**

**PART—A 3×10=30 Marks**

**Instructions: (1) Answer all questions.**

**(2) Each question carries three marks.**

**(3) Answers should be brief and straight to the point and shall not exceed five simple sentences**

1. List the mechanical properties of structural steel. (CO1)
2. Define the following terms : (CO2)
   (a) Size of fillet weld(b) Throat thickness of fillet weld
3. What shall be the maximum size of the fillet weld applied to the (CO2)
   ii) square edge of a plate, and (b) round edge of a flange
4. Write any three applications of tension members. (CO3)
5. Define the following terms : (CO4)
   iii) Least radius of gyration and (b) Slenderness ratio
6. Write any three codal provisions to be followed in the design of lacing system as per IS : 800–2007. (CO4)
7. Write any three provisions for design of double angle strut as IS 800-2007. (CO5)
8. Draw the cross section of plate girder and label the component parts. (CO5)
9. Define elastic moment and plastic moment of resistance. (CO5)
10. Determine the live load per square metre of plan area of the pitched roof of slope 26°. (CO5)

**PART – B 8 x 5 marks = 40 marks**

**Answer either (a) or (b) from each questions from Part-B**

11. A) An angle ISA 100 mm × 100 mm × 12 mm is carrying an axial design tensile force of 220 kN acting through the CG of the angle isto be connected to a gusset plate 12 mm thick by a lap joint using side welds and end welds, at site. Design the joint taking the ultimate design stress in the filet weld as 410 N/mm2. (CO2)

**(OR)**

B) A tie member in a truss consists of a pair of angles 2 ISA 100 × 75 × 10 mm connected to a gusset plate of 12 mm thickness by shop fillet welds on both sides of the angle. Design the welded joint if the member carries a tensile load of 495 kN and ultimate stress in the fillet weld is 410 Mpa. (CO2)

12. A) Determine the design strength of a tensile member ISA 100 mm × 75 mm × 10 mm when its longer leg is connected to 10 mm gusset plate by 7 mm size fillet welds. The effective length of the weld is 170 mm. [Take f y = 250Mpa and f u = 410Mpa.] (CO3)

**(OR)**

B) Design a double angle tension member to carry an axial tension of 480 kN, using steel of yield stress 250 N/mm$^2$& ultimate stress 410 N/mm$^2$. The effective length of the member is 6 m. The angle are to be connected on either side of 12 mm gusset plate by fillet welds.

13. A) Design a steel column using a single rolled I-section to carry an axial load of 800 kN. One end of the column is restrained against translation and rotation and the other end is restrained against translation and free against rotation. The actual length of the column between intersections is 6 m and the yield stress of steel is 250 Mpa. (CO4)

**(OR)**

B) Design a slab base for a column consisting of ISHB 350 @724 N/m. The column carries an axial load of 520 kN. M20 grade concrete is used for foundation. Assume Fe-410 grade steel used. Also design the welded connection.

14. A) Determine the design compressive strength of single angle discontinuous strut ISA 80 mm × 80 mm × 10 mm of length 2 m when connected to gusset plate through one leg by fillet welds at each end. Yield stress of steel used is 340 Mpa and modulus of elasticity of steel is 2 x $10^5$ Mpa. The gusset fixity may be taken as hinged. (CO5)

**(OR)**

B) Design a single angle, section to carry a compression of 100 kN. The c/c distance between the end connections is 2·2 m. Assume that the end connections is done by the fillet welds. The grade of the steel is 250 Mpa.

15. A) Design a slab base with rectangular base plate having equal projections for a column ISHB 300 @ 577 N/m carrying an axial factored load of 1000 kN. Use M20 grade concrete and Fe 250 grade steel. Also design the concrete pedestal if the safe bearing capacity of soil is 190 kN/m$^2$. (CO5)

**(OR)**

B) (a) Write a note on the effect of holes in the tension zone of a laterally supported beam.

(b) Determine the shape factor for a rectangular section of width b and depth d.

**PART – C**

**Question No.16 is compulsory and carries 10 marks** **10X1=10 marks**

16. Explain the procedure of designing a slab base for a column with given section and axial load and also explain how welded connections are provided to it. (CO4)

***

# ENVIRONMENTAL ENGINEERING

| Course code | Course Title | No. Of periods/week | Total No. Of periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-502 | Environmental Engineering | 05 | 75 | 20 | 80 |

| S.No. | Major Topics | No. Of periods/week | Cos Mapped |
|---|---|---|---|
| 1. | Environment and Ecology | 5 | CO1 |
| 2. | Water Supply Scheme & Sources and Conveyance of Water | 8 | CO1 |
| 3. | Quality and Purification of Water | 14 | CO2 |
| 4. | Distribution system and water supply arrangements in a Building | 4 | CO2 |
| 5. | Introduction to Sanitary Engineering & Quantity of Sewage | 8 | CO3 |
| 6. | Laying of Sewers & Sewer appurtenances | 5 | CO3 |
| 7. | Characteristics of Sewage, treatment & disposal | 13 | CO4 |
| 8. | Solid waste disposal and Sanitation in buildings | 8 | CO5 |
| 9. | Rural Water Supply and Sanitation | 7 | CO5 |
| 10. | Air Pollution | 3 | CO5 |
| | **Total Periods** | **75** | |

**COURSE OBJECTIVES:**

| Upon completion of the course the student shall be able to | | |
|---|---|---|
| **Course Objectives** | (i) | Familiarise with basic knowledge on environment and ecology, history of water supply, Understand the sources, quality & quantity, collection, conveyance, testing and treatment techniques of water. |
| | (ii) | Understand the storage, distribution and water supply arrangements in buildings. |
| | (iii) | Learn basic knowledge of the sanitary Engineering, Sewerage works, methods of sewage collection, basic concepts of design of sewers, their laying with appurtenances |
| | (iv) | Explain the methods of sewage treatment and disposal, methods of solid waste collection & disposal and sanitation in buildings, in Rural areas and fundamentals of air pollution. |

**COURSE OUTCOMES:**

| | | | |
|---|---|---|---|
| **Course Outcomes** | CO1 | C-502.1 | Explain the terms (i) Environment and ecology (ii) Water supply scheme (iii) Per capita demand (iv) Sources (v) conveyance of water |
| | CO2 | C-502.2 | Explain the quality and treatment of water, systems of distribution, methods of water supply and water supply arrangements in buildings |
| | CO3 | C-502.3 | Describe the basics of sanitary engineering, sewer design, laying of sewers and sewer appurtenances. |
| | CO4 | C-502.4 | Explain the methods of Sewage treatment and disposal |
| | CO5 | C-502.5 | Discuss (i) Methods of disposal of solid waste (ii) Sanitation in Building (iii) Rural water supply and sanitation(iv) Fundamentals of air pollution. |

**LEARNING OUTCOMES:**

| | |
|---|---|
| **Learning Outcomes** | **1. Environment and Ecology**<br>1.1. Define Environment, Ecology and Ecosystem.<br>1.2. Describe the various global environmental issues like Define Acid rain, Greenhouse effect, Global warming and Ozone layer depletion.<br>1.3. List the causes and effects of Acid rain, Greenhouse effect, Global warming and Ozone layer depletion.<br>1.4. Differentiate renewable and non-renewable energy sources and List examples for renewable and non-renewable energy sources.<br>1.5. List the components of Ecosystem and explain the flow of matter and energy in an ecosystem.<br>1.6. List the factors affecting the stability of an ecosystem.<br>1.7. Explain the concept of sustainable development.<br><br>**2. Water supply scheme, Sources and conveyance of water**<br>2.1. Explain the importance and development of water supply<br>2.2. States the need for protected water supply, objectives of protected water supply scheme and draw the flow chart of a typical water supply scheme of a town.<br>2.3. List the factors affecting per capita demand of a town/city and state the requirements of water for various purposes: Domestic purpose, Industrial use, Firefighting, Commercial and institutional needs and public use. Explain the variation in demand for water supply.<br>2.4. Estimate the quantity of water required by different towns, State the need and methods of forecasting population, Solve problems on forecasting population by different methods.<br>2.5. State the common sources of water for a water supply scheme, different types of surface & sub surface sources of water,merits and demerits of surface and sub surface water sources,salient features of surface sources.<br>2.6. Define Aquifer, Aquiclude and Ground water table,classify wells according to construction,Define Draw down, Critical depression head, Circle of influence, Cone of depression, Confined aquifer, unconfined aquifer and |

| | |
|---|---|
| | Specific yield, Explain the procedure for determining yield of a well by pumping tests (Constant Pumping and Recuperation Tests).<br>2.7. Explain with sketches: Infiltration galleries and Infiltration wells<br>2.8. Explain intakes for collection of water (reservoir intake, river intake, canal intake and Lake Intake) with sketches.<br>2.9. Explain different methods of conveyance of water, merits and demerits of different types of pipes, different joints used for connecting pipes with sketches, method of Pipe laying and testing.<br>**3. Quality and purification of water**<br>3.1. State different types of impurities, need for laboratory tests, explain the method of obtaining samples for testing, different tests for analysing quality of water with their significance.<br>3.2. Define: Ecoli index and Most Probable Number (MPN), State the significance of Ecoli in water analysis, Explain the importance of chemical and bacteriological analysis of water used for domestic purpose.<br>3.3. State the various water borne diseases in India, State the maximum acceptable limits of Turbidity, Hardness, Nitrates and Fluorides for the public drinking water.<br>3.4. State the objectives of treatment of water, Sketch the layout of a water treatment plant indicating the different stages, List the points to be considered in locating a treatment plant.<br>3.5. State the objectives and explain the process of Aeration, Plain sedimentation, Sedimentation with coagulation, Filtration and Disinfection.<br>3.6. Describe different types of sedimentation tanks.<br>3.7. Describe the construction and operation of slow sand filters, Rapid sand filters and pressure filters and compares them.<br>3.8. Define disinfection of water, Explain the need for disinfecting water, methods of disinfection of water and types of Chlorination.<br>3.9. List the substances responsible for causing colour, taste and odour, Explain the temporary hardness and permanent hardness, various methods of removal of hardness.<br>**4. Distribution system and Water supply arrangements in Buildings**<br>4.1. State the requirements and classification of distribution system,explain different systems of distribution with sketches<br>4.2. List and explain the different methods of water supply system and state their merits and demerits.<br>4.3. State the necessity for service reservoirs, Draw sketches of rectangular overhead service reservoir showing all accessories.<br>4.4. Explain with sketches the different layouts in distribution system, state their merits and demerits and their suitability for a given locality.<br>4.5. List and Explains with sketches the location and functioning of various appurtenances used in a distribution system.<br>4.6. Explain methods of detecting leakages, methods of rectification and prevention of leakages in water supply mains.<br>4.7. Define terminology used while making water supply arrangements in buildings, State the principles in laying pipelines within the premises of a building.<br>4.8. Explain the general layout of water supply connections of buildings, explain water Supply arrangements for single and multi-storeyed buildings as per I.S. Code. |

| | |
|---|---|
| | 4.9. State the general precautions to be taken in plumbing work for buildings.<br>4.10. Explain the water supply connection to a building from a water main and uses of different fittings: ferrule, goose neck, stopcock.<br><br>**5. Introduction to sanitary engineering and quantity of sewage**<br>5.1. State the objectives of sewage disposal works.<br>5.2. Define the terms: Sewage, Sewer and Sullage,Sewerage, Refuse and Garbage<br>5.3. List the objectives of sewerage works and explain various methods of sewage collection works and compare them.<br>5.4. Explain the different sewerage systems, compare them, discus their suitability<br>5.5. State the main constituents of sewage for calculating quantity, define Dry weather flow, discuss the factors affecting, state the factors affecting the quantity of storm sewage and explain the variation in rate of sewage.<br>5.6. Estimate the quantity of storm water flow using 1. Rational method and 2. Empirical formulae.<br>5.7. List the requirements of good surface drains, explain different types of surface drains with their merits and demerits.<br>5.8. State the limiting velocities of flow in sewers, works out simple problems on design of sewers running half full only.<br>5.9. Explain the use of nomograms in detail in the design of sewers.<br><br>**6. Laying of sewers and Sewer appurtenances**<br>6.1. State various shapes of sewers, explain them with sketch, discuss their merits and demerits.<br>6.2. Mention different materials used for sewers discuss their merits and demerits.<br>6.3. Explain the method of laying the sewers as per given alignment, the necessity of providing sewer appurtenances on the sewer lines.<br>6.4. Explain the construction, function and location of the different sewer appurtenances.<br>6.5. State the situations under which sewage pumping is necessary,explain the component parts of a pumping station and factors influencing its location.<br>6.6. Explain the construction and working of Shone's ejector with the help of a sketch.<br>6.7. Describe the testing of sewers.<br><br>**7. Characteristics of sewage, Treatment and disposal**<br>7.1. Define strength of sewage, describe the method of sampling sewage.<br>7.2. State the physical, chemical and biological characteristics of sewage.<br>7.3. Define C.O.D and B.O.D. State the significance of tests like i) Total Solids (ii) C.O.D. (iii) B.O.D. (iv) PHValue (v) Chlorides.<br>7.4. State the characteristics of industrial waste water, explain the principles of treatment of industrial waste water.<br>7.5. State the objects of sewage treatment. Draw the conventional sewage treatment plant of a town and indicate the units.<br>7.6. State the function of screens, skimming tanks and grit chambers and explain their working.<br>7.7. Explain with sketch wherever necessary the treatment works : |

| | |
|---|---|
| | Sedimentation tank, Trickling filters, Activated sludge process, Oxidation ditch, Oxidation pond, Aerated lagoons, Anaerobic lagoons, Sludge digesters<br>7.8. Compare activated sludge process and trickling filters. List out various methods of sludge disposal and briefly explain them.<br>7.9. Explain with sketch the treatment of sewage by septic tank and soak pit.<br>7.10. List and explain the various methods of sewage disposal.<br><br>**8. Solid waste disposal and Sanitation in Buildings**<br>8.1. Define the term' Refuse'<br>8.2. State the classification of solid wastes<br>8.3. Explain the methods of disposal of solid wastes, state the merits and demerits for each.<br>8.4. Define composting, explain the methods of composting, Explain the equipment required and preparation of compost by mechanical composting.<br>8.5. State the aims of building drainage and requirements of good drainage system in buildings.<br>8.6. Define the terms: soil pipe, waste pipe, vent pipe, anti-siphonage pipe.<br>8.7. Describe the layout of sanitary fittings and house drainage arrangements for buildings (single and multi-storeyed).<br>8.8. Explain with sketches the different types of plumbing systems.<br>8.9. Describe different sanitary fittings like water closets, flushing cisterns, urinals, inspection chambers, traps, anti-siphonage pipes.<br>8.10. Explain the procedures involved in the inspection, testing and maintenance of sanitary fittings.<br><br>**9. Rural water supply and sanitation**<br>9.1. Explain the process of disinfection of wells by two pot method.<br>9.2. Explain the methods of rural sanitation.<br>9.3. Describe with sketches the construction of sanitary latrines in rural areas.<br>9.4. State the advantages of biogas plant, factors on which the production of biogas depends, describe the construction and working of K.V.I.C. model and Janata model biogas plant with a neat sketch.<br>9.5. State vermi composting and explain the procedure of vermi composting and mention its advantages.<br>**10. Air pollution**<br>10.1 Define the term air pollution, state and explain the sources of air pollution.<br>10.2 Explain the effects of air pollution on human health & vegetation and on atmosphere & materials.<br>10.3 State methods of control of air pollution.<br>10.4 State various types of controlling devices and equipment. |

**PO-CO Mapping:**

| Course Code : C-502 | Course Title: Environmental Engineering<br>Number of Cos: 05 | | | | No. Of Periods: 75 |
|---|---|---|---|---|---|
| PO # | Mapped with CO # | CO Periods addressing PO in Column 1 | | Level (1,2,3) | Remarks |
| | | No | % | | |
| PO1 | CO1, CO2, CO3, CO4, CO5 | 30 | 40 | 3 | **> 40% Level 3 Highly addressed**<br>**25% to 40% Level 2 Moderately addressed**<br>**5 to 25% Level 1 Low addressed** |
| PO2 | CO1, CO3, CO4, CO5 | 20 | 27 | 2 | |
| PO3 | CO2, CO3, CO4, CO5 | 13 | 17 | 1 | |
| PO4 | CO5 | 6 | 8 | 1 | |
| PO5 | CO1, CO5 | 6 | 8 | 1 | |
| PO6 | - | - | - | - | |
| PO7 | - | - | - | - | |

**CO-PO Mapping:**

| CO No. | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | | | 2 | | | 2 | 3 | 2 |
| CO2 | 3 | | 1 | | | | | 2 | 3 | 2 |
| CO3 | 3 | 2 | 1 | | | | | 2 | 3 | 2 |
| CO4 | 3 | 2 | 1 | | | | | 2 | 3 | 2 |
| CO5 | 2 | 1 | 2 | 1 | 2 | | | 2 | 3 | 2 |
| Average | 2.6 | 2.0 | 1.25 | 1.0 | 2 | | | 2 | 3 | 2 |

**Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**

**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz**

**(vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc**

## COURSE CONTENT

### 1. Environment and Ecology

Environment – Biosphere – Atmosphere – Acid rain, Greenhouse effect, Global warming – Ozone layer depletion. Renewable and non-renewable energy sources with examples. Ecology and Ecosystem – components of ecosystem – Flow of matter in an ecosystem (food pyramid) – Flow of energy in an ecosystem –Ecological balance and stability of an ecosystem – Sustainable development with examples.

### 2. Water Supply Scheme &Sources and Conveyance of Water

General importance of water supply –Development of Water supply–Need for protected Water supply-Flow chart of a typical water supply scheme– Total quantity of water for a town, per capita demand and factors affecting demand - Water requirements for domestic purposes, industrial use, firefighting, commercial and institutional needs, public use – Variation in demand peak demand – seasonal, daily and hourly variation– Forecasting population by arithmetical, geometrical and incremental increase methods-problems on above methods.

Surface source Lakes, streams, rivers and impounded reservoirs – Underground sources-springs, wells, infiltration wells and galleries – Yield from wells by constant pumping and recuperation tests. (No problems required) - Comparison of surface and subsurface sources Types of intakes - Reservoir intake, River intake, Canal intake, Lake Intake - Conveyance of water-open channels, aqueduct pipes - Pipe Materials C.I Pipes, Steel Pipes, concrete pipes, A.C. Pipes, G.I. Pipes Plastic Pipes (PVC &HDPE), merits and demerits of each type - Pipe joints spigot and socket joint, flange joint, expansion joint for C.I. Pipe, joints for concrete and asbestos cement pipes - Pipe Laying and testing, Leak detection, prevention and rectification.

### 3. Quality and Purification of water.

Impurities of water need for laboratory test – sampling grab and composite sampling– Tests of water physical, chemical and bacteriological tests – P**H** value of water. – Standard quality for domestic use and industrial purposes - Flow diagram of different treatment units. – Aeration methods of aeration- Sedimentation plain sedimentation and sedimentation with coagulation - Filtration Construction and operation of slow sand, rapid sand and pressure filters - Disinfection of water necessity and methods of chlorination, prechlorination, break point chlorination - Colour, taste and odour control. Hardness – Types of Hardness Removal of hardness. NOTE: No design of treatment units.

**4.Distribution system and water supply arrangements in a Building.**

General requirements– systems of distribution - gravity system, combined system, direct pumping - Methods of supply Intermittent and continuous Storage – underground and overhead service reservoirs - necessity and accessories – Types of layout dead end, grid, radial and ring system their merits and demerits and their suitability– Location and functioning of: Sluice valves, Check valves or reflux valves, Air valves, Drain valves or blow off valves, Scour valves, Fire Hydrants, Water meters– Water supply arrangements in building – Definition of terms; water main, service pipe, communication pipe, supply pipe, distribution pipe, air gap - General layout of water supply arrangement for single and multi-storeyed buildings as per I.S Code of practice general principles and precautions in laying pipelines within the premises of a building - Connections from water main to building with sketch - Water supply fittings, their description and uses stopcock, ferrule, goose neck etc.

**5.Introduction to Sanitary Engineering and Quantity of Sewage**

Object of providing sewerage works - Definition of terms : sullage, sewage, sewer and sewerage – classification of sewage - System of sewage disposal water carriage systems – Types of sewerage systems and their suitability – separate, combined and partially separate systems –Quantity of discharge in sewers, dry weather flow, variability of flow Determination of storm water flow – run off coefficient, time of concentration, rational method and empirical formulae for runoff - Surface drainage requirements, shapes, laying and construction – Simple problems on design of sewers (running half full only) using Manning's and Hazen Williams formulae - Use of nomograms as per I.S.1742 to determine the unknown values of gradient, diameter, discharge and velocity.

**6.Laying of Sewers and Sewer Appurtenances**

Different shapes of cross section for sewers – circular and noncircular – merits and demerits of each - Brief description and choice of types of sewers - stone ware, cast iron, cement concrete sewers and A.C Pipes - Laying of sewers setting out alignment of a sewer, excavation, checking the gradient , preparation of bedding, handling, lowering, laying and jointing, testing and back filling - Brief description, location, function and construction of Manholes, Drop manholes, Street inlets, Catch basins, Flushing tanks, Regulators, Inverted siphon - Necessity of pumping sewage location and component parts of a pumping station.

**7.Characteristics of Sewage, treatment & disposal**

Strength of sewage - sampling of sewage, characteristics of sewage physical, chemical and biological Analysis of sewage – significance of the following tests for (No details of tests) Solids, C.O.D, B.O.D, Ph Value, Chlorides Characteristics of Industrial waste water– principles of treatment– Reduction of volume and strength of wastewater, Equalization, Neutralization and proportioning Preliminary treatment Brief description and functions of following units Screens, Skimming tanks and Grit chambers - Primary treatment - Brief description and functions of Plain sedimentation - Secondary treatment Brief description of Trickling filters - Activated sludge process, Oxidation ditch, Oxidation pond, Aerated lagoons, Anaerobic lagoons Sludge digestion – Process and methods of sludge disposal - Miscellaneous treatments septic tank Sewage disposal dilution, disposal on to lands, ground water recharge, reuse etc.

**8.Solid Waste Disposal and Sanitation in Buildings**

Types of Solid wastes - Methods of disposal- uncontrolled dumping, tipping or sanitary land fill – Incineration – composting Preparation of compost equipments required such as storage hoppers, grinders conveyors etc., in mechanical composting Aims of building drainage and its requirements – General layout of sanitary fittings to a house drainage arrangements for single and multi-storeyed buildings as per IS code of practice plumbing systems Sanitary fittings – traps, water closets, flushing cisterns, urinals, inspection chambers, anti siphonage Inspection, testing and maintenance of sanitary fittings.

**9.Rural Water Supply and Sanitation**

Disinfection of wells -Rural sanitation and sanitary latrines, biogas production technology brief description and operational details of biogas plants using animal waste, night soil and agricultural wastes KVIC and JANATA models merits and demerits – maintenance of biogas plant Vermi composting –procedure –advantages.

**10.Air Pollution**

Definition sources of air pollution – effects of air pollution – methods of Control of air pollution – Knows Air pollution control equipment.

**REFERENCE BOOKS:**


1. Water Supply & Sanitary Engineering – Including Environmental Engineering & Pollution Control Act's, G. S. Birdie,Dhanapati Rai publishing company
2. Elements of Environmental engineering, K.N. Duggal, S. Chand Publications
3. Textbook of Water Supply and Sanitary Engineering, S.K. Hussain, CBS Publishers and distributors Pvt Ltd.
4. EnvironmentalEngineering,N.N.Basak, Tata Mc Graw-Hill education
5. Water Supply Engineering, Santosh Kumar Garg, Khanna Publishers

**MODEL BLUE PRINT**

| S.No | Chapter Name | Periods allocated | Weightage of marks | Mark wise Distribution of Weightage | | | | Question wise Distribution of Weightage | | | | Linked with CO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | R | U | Ap | An | R | U | Ap | An | |
| 1. | Environment and Ecology | 5 | 3 | 3 | | | | 1 | | | | C01 |
| 2. | Water Supply Scheme & Sources and Conveyance of Water | 8 | 8 | | 3 | 8 | | | 1 | 1 | | C01 |
| 3. | Quality and Purification of Water | 14 | 6 | 3 | | | | 1 | | | | C02 |
| 4. | Distribution System | 4 | 11 | 3 | | 8 | | 1 | | 1 | | C02 |
| 5. | Introduction to Sanitary Engg& Quantity of Sewage | 8 | 11 | 3 | | 8 | | 1 | | 1 | | C03 |
| 6. | Laying of Sewers & Sewers appurtenances | 5 | 3 | 3 | | | | 1 | | | | C03 |
| 7. | Characteristics of Sewage, treatment & disposal | 13 | 11 | 3 | | 8 | | 1 | | 1 | | C04 |
| 8. | Solid waste disposal and Sanitation in buildings | 8 | 11 | 3 | | 8 | | 1 | | 1 | | C05 |
| 9. | Rural Water Supply and Sanitation | 7 | 3 | 3 | | | | 1 | | | | C05 |
| 10. | Air Pollution | 3 | 3 | 3 | | | | 1 | | | | C05 |
| | **Higher order question from any or combination of the chapters 7,8,9,10** | | 10 | | | 10 | | | | 1 | | C04, C05 |
| | Total | 75 | 80 | 27 | 03 | 50 | | 10 | 5 | 1 | | |

**Table specifying the scope of syllabus to be covered for Unit Test-I & Unit Test-II**

| Unit Test | Learning Outcomes to be covered |
|---|---|
| Unit Test – I | From 1.1 to 4.10 |
| Unit Test – II | From 5.1 to 10.4 |

**Model Paper for Unit Test-I**

**State Board of Technical Education and Training, A.P.**

**Diploma in Civil Engineering (DCE)**

**Fifth Semester :C-502 ENVIRONMENTAL ENGINEERING**

**Time: 90 Minutes** **Unit Test –I** **Maximum Marks : 40**

**PART- A** **16 Marks**

**Instructions :**

**(i) Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1. (a) For an average Indian conditions, per capita consumption of water is ___lpcd. (CO1)

   (b) Yield per unit draw down is called _____ (CO1)

   (c) In water treatment plants, commonly used coagulant is _____ (CO2)

   (d) The valve which allows flow in one direction is called_____ (CO2)

2. What is the difference between environment and ecology? (CO1)

3. List various surface and sub surface sources of water. (CO1)

4. List out the objects of sedimentation. (CO2)

5. What is the function of sluice valve? Draw the sketch. (CO2)

**PART- B** **3 x 8 = 24 Marks**

**Instructions :**

**(i) Answer all questions**

**(ii) Each question carries EIGHT marks**

**(iii)Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A) Estimate the future population of the town in 2021 by Arithmetic Increase method and Incremental Increase method. (CO1)

| Year | 1931 | 1941 | 1951 | 1961 | 1971 | 1981 | 1991 |
|---|---|---|---|---|---|---|---|
| Population | 350000 | 466000 | 994000 | 1560000 | 1623000 | 1839000 | 2430000 |

(OR)

(B) Describe briefly the construction and working of Infiltration wells with the help of neat sketch. (CO1)

7. (A) Explain working of a slow sand filter with the aid of neat sketch. (CO2)

(OR)

(B) What do you understand by “Break point chlorination” and explain with the help of diagram the significance of various stages in it. (CO2)

8. (A) Explain “Grid iron system” with a sketch and mention the advantages and dis advantages. (CO2)

(OR)

(B) How do you detect leakages and what are the preventive measures. (CO2)

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**Model Paper for Unit Test-II:**
**State Board of Technical Education and Training, A.P.**
**Diploma in Civil Engineering (DCE)**
**Fifth Semester : C-502 ENVIRONMENTAL ENGINEERING**

**Time: 90 Minutes** **Unit Test –II** **Maximum Marks : 40**

**PART- A** **16 Marks**

**Instructions :**

**(i) Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1. (a) Rational formula for calculation of storm water flow is given by Q = _____ (CO3)
   (b) The Hydraulic mean depth of a circular sewer running half full is_____ (CO3)
   (c) The bacteria which can survive and grow both in the presence and absence of oxygen are called_____ (CO4)
   (d) The pipe which is used to prevent 416ehaviour action in drainage pipes is called____ (CO5)
2. List any three objects of sewerage works. (CO3)
3. State three advantages of Trickling filter. (CO4)
4. What is the significance of BOD in sewage treatment? (CO4)
5. Define Soil pipe, waste pipe, vent pipe. (CO5)

**PART- B** **3 x 8 = 24 Marks**

**Instructions :**

**(i) Answer all questions**

**(ii) Each question carries EIGHT marks**

**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A) what is meant by water carriage system? List the merits and demerits of it. (CO3)

(OR)

(B) Explain the circular sewer with the help of a sketch and list any two merits and demerits. (CO3)

7. (A) Draw the flow diagram of conventional sewage treatment plant and indicate the main functions of each unit. (CO4)

(OR)

(B) What do you mean by Activated sludge process? Draw the flow diagram. (CO4)

8. (A) Sketch and Explain the working of a Septic tank. (CO4)

(OR)

(B) What is meant by composting? Explain the Bangalore method and Indore method of Composting. (CO5)

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**Model Paper for End Examination**

**MODEL PAPER – BOARD DIPLOMA EXAMINATION, (C–20)**

**DCE—FIFTH SEMESTER EXAMINATION**

**ENVIRONMENTAL ENGINEERING (C-502)**

**Time: 3 hours]** **[Total Marks: 80**

**PART—A** **3×10=30 Marks**

**Instructions: (1) Answer all questions.**

**(2) Each question carries three marks.**

**(3) Answers should be brief and straight to the point and shall not exceed five simple sentences.**

1. List any three factors affecting per capita demand. (CO1)
2. Define the terms aquifer and drawdown. (CO1)
3. Define Sedimentation. (CO2)
4. List the methods of chlorination. (CO2)
5. Define Dry weather flow. (CO3)
6. Draw the neat sketch of drop manhole. (CO3)
7. List any three objects of treatment of sewage. (CO4)
8. Define the terms i) Garbage ii) Refuse. (CO5)
9. What are the different methods of testing drains? (CO5)
10. What are the sources of air pollution? (CO5)

**PART – B** **8 x 5 marks = 40 marks**

**Answer either (a) or (b) from each questions from Part-B**

11. (A) Explain the canal intake with neat sketch. (CO1)

**(OR)**

(B) The following table shows the population of a town from 1981 to 2011. (CO1)

| Year | 1981 | 1991 | 2001 | 2011 |
|---|---|---|---|---|
| Population | 45000 | 52000 | 60000 | 64000 |

Find the future population of the town by the end of 2041 by

(i) Arithmetical Increment method

(ii) Geometrical Increase method.

12. (A)Explain the construction and operation of slow sand filter. (CO2)

**(OR)**

(B)Explain any two systems of water distribution with sketches. (CO2)

13. (A)The catchment area of a town is 250 hectares, out of which 25% with water tight roofs, 23% asphaltic roads, 22% unpaved streets, 30% lawns and gardens. The runoff coefficients are 0.9, 0.85, 0.15 and 0.12 respectively. Calculate the storm water flow for a rainfall intensity of 50 mm/hr by rational method. (CO3)

**(OR)**

(B)Explain various operations involved in laying of sewers. (CO3)

14. (A)Explain construction and working of Trickling filter with a neat sketch. (CO4)

**(OR)**

(B)Explain method of sewage disposal on land and water. (CO4)

15. (A)State requirements of good drainage in buildings. (CO5)

**(OR)**

(B)Explain the methods of rural sanitation. (CO5)

**PART – C** **( 1 x 10 = 10 Marks)**

**Note : Answer the Question given below.**

16. Distinguish between attached growth system and suspended growth system of Biological Treatment process? Explain activated sludge process of treatment of sewagewith the help of flow diagram. (CO4)

***

# QUANTITY SURVEYING – II

| Course code | Course title | No. Of period/week | Total no. Of periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-503 | Quantity Surveying-II | 04 | 60 | 20 | 80 |

| S. No. | Major Topics | No. Of periods | Cos Mapped |
|---|---|---|---|
| 1 | Detailed estimate of R.C.C. elements | 06 | CO1 |
| 2 | Estimation of quantity of steel in R.C.C. elements | 06 | CO1 |
| 3 | Detailed estimates of Roads and Culverts | 16 | CO2 |
| 4 | Detailed estimates of Irrigation and Public Health Engineering works | 16 | CO3 |
| 5 | Valuation of buildings | 8 | CO4 |
| 6 | Rent Fixation | 8 | CO4 |
| | **Total** | 60 | |

**COURSE OBJECTIVES:**

| Upon completion of the course, the student shall be able to | | |
|---|---|---|
| **Course Objectives** | (i) | Familiarize with the preparation of detailed estimate of various R.C.C. elements and calculation of quantity of steel in R.C.C. elements |
| | (ii) | Prepare detailed estimates of roads and culverts, irrigation and public health engineering works. |
| | (iii) | Learn the methods of valuation of properties and methods of rent fixation and solve simple problems. |

**COURSE OUTCOMES*:***

| | | | |
|---|---|---|---|
| **Course Outcomes** | CO1 | C-503.1 | Prepare the estimate for various R.C.C. Structural elements and quantity of steel reinforcement in different R.C.C elements |
| | CO2 | C-503.2 | Prepare detailed estimates of quantities required for construction of Roads and Culverts |
| | CO3 | C-503.3 | Prepare detailed estimates of quantities required for construction of irrigation and public health engineering structures. |
| | CO4 | C-503.4 | Explains the Methods of valuation of Properties and Apartments and method of Rent fixation of building using principles and by CPWD guidelines |

**LEARNING OUTCOMES:**

| | |
|---|---|
| **Learning Outcomes** | **1.0 Estimation of R.C.C. Structural elements**<br>1.1 List various components of Dog legged staircases<br>1.2 Prepare detailed estimate of Dog legged staircase<br>2.0 **Estimation of steel reinforcement in different R.C.C elements**<br>2.1 State the codal provisions for reinforcement in R.C.C. elements of a building as per IS 456: 2000<br>2.2 Distinguish between straight bars and cranked bars used in simply supported beams<br>2.3 Compute the lengths of straight, cranked bars and stirrups used in Simply supported beams<br>2.4 Distinguish between main reinforcement and distribution reinforcement used in R.C.C. slabs<br>2.5 Compute the quantity of steel reinforcement for different elements of R.C.C works in a building by preparing a bar bending schedule<br>**3.0 Detailed estimates of roads and culverts**<br>3.1 Prepare a detailed estimate for different types of roads<br>3.2 Prepare a detailed estimate for (a) Pipe culvert (b) Slab culvert<br>**4.0 Detailed estimates of Irrigation and Public Health Engineering works**<br>4.1 Prepare a detailed estimate for the following items:<br>a) Open well<br>b) R.C.C. Square/Rectangular overhead tank<br>c) Sanitary block<br>d) Tank sluice with tower head<br>4.2 State the items to be included in the abstract estimates of above structures<br>**5.0 Valuation of buildings**<br>5.1 Definition – Value, Cost and Price, Scrap value, Salvage value, Market value, Book value, sinking fund and its meaning – purpose of valuation – factors governing valuation.<br>5.2 Depreciation – Sinking fund – Annuity – Capitalized value.<br>5.3 Methods of valuation – Land & building method, Development method, Depreciation method, Rental method, Capitalization method, Profit method, Simple problems on each of the above method.<br>5.4 Valuation of Apartments- ownership concept-factors contributing the value of flat – methods of valuation of flat –comparable sale insurance method, land & building method, Investment method, Rent capitalization method<br>5.5 Valuation of properties of wealth tax, valuation for purpose of capital gains tax – examples for each<br>5.6 Valuation for purpose of cost of construction – valuation for mortgage – valuation for fire insurance – Valuation by use of valuation tables<br>**6.0 Rent fixation**<br>6.1 Rent fixation of building – principles of rent fixation by CPWD – Fair rent method.<br>6.2 Simple problems on rent fixation |

**PO-CO Mapping:**

| Course Code : C-503 | Course Title: Quantity Surveying – II<br>Number of Cos: 04 | | | | No. Of Periods: 60 |
|---|---|---|---|---|---|
| Pos | Mapped with CO No. | CO Periods addressing PO in Column 1 | | Level (1,2,3) | Remarks |
| | | No | % | | |
| PO1 | CO1, CO2, CO3, CO4 | 24 | 40 | 3 | > 40% Level 3<br>Highly addressed |
| PO2 | CO1, CO2, CO3, CO4 | 24 | 40 | 3 | |
| PO3 | CO1, CO2, CO3, CO4 | 12 | 20 | 1 | |
| PO4 | | | | | 25% to 40% Level 2<br>Moderately addressed |
| PO5 | | | | | |
| PO6 | | | | | 5% to 25% Level 1<br>Low addressed |
| PO7 | | | | | <5% Not addressed |

**CO-PO Mapping:**

| CO No. | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | | | | | 3 | 2 | 3 |
| CO2 | 3 | 3 | 2 | | | | | 3 | 2 | 3 |
| CO3 | 3 | 3 | 2 | | | | | 3 | 2 | 3 |
| CO4 | 2 | 3 | 2 | | | | | 3 | 2 | 3 |
| Average | 2.75 | 2.75 | 2 | | | | | 3 | 2 | 3 |

**Note: The gaps in CO-PO mapping will be met by one or more appropriate activities from the following: (i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc.**

## COURSE CONTENT

**1.0 Detailed estimate of R.C.C. elements:**

Various components and detailed estimate of Dog legged staircase

**2.0 Estimation of quantities of steel in R.C.C. elements:**

Simply supported singly reinforced R.C.C. beams/Lintel – Simply supported one-way slab – R.C.C. column with square footing – Preparation of Bar bending schedule for the above

**3.0 Detailed Estimates of Roads and Culverts:**

Gravel Road – Water bound macadam road – Surface dressing with bitumen – Cement concrete road – Pipe culvert – R.C.C. slab culvert with i) straight returns and ii) splayed wing walls – Different items in abstract estimate (Labour charges, Traffic diversion etc.)

**4.0 Detailed Estimates of Irrigation and Public Health Engineering works:**

Open well with masonry staining – R.C.C. Rectangular/square overhead tank – Sanitary block – Tank sluice with tower head – Different items to be included in the abstract estimates of the above

**5.0 Valuation of buildings**

Definition – Value, Cost and Price, Scrap value, Salvage value, Market value, Book value, sinking fund and its meaning – purpose of valuation – factors governing valuation – Depreciation – Sinking fund – Annuity – Capitalized value – Methods of valuation – Land & building method, Development method, Depreciation method, Rental method, Capitalization method, Profit method, Simple problems on each of the above method – Valuation of Apartments- Ownership concept-factors contributing the value of flat – methods of valuation of flat –comparable sale insurance method, land & building method, Investment method, Rent capitalization method – Valuation of properties of wealth tax, valuation for the purpose of capital gains tax – examples for each of these – Valuation for purpose of cost of construction – valuation for mortgage – valuation for fire insurance – Valuation by use of valuation tables

**6.0 Rent fixation**

Rent fixation of building – Principles of rent fixation by CPWD – Fair rent method – Simple problems. On rent fixation

**REFERENCE BOOKS:**


1. Estimating and Costing in Civil Engineering, B N Dutta, CBS Publications
2. Estimating,Costing,Specification & Valuation In Civil Engineering, by M Chakraborti, Chakraborti publishers
3. Estimating, Costing and Valuation, Rangwala, Charotar Publications
4. Civil Estimating & Costing: Including Quality Surveying, Tendering and Valuation,A.K. Upadhyay, S K Kataria and Sons Publications

**MODEL BLUE PRINT**

| S. No | Major Topics | No. Of periods | Weightage of marks | Marks wise Distribution of Weightage | | | | Question wise Distribution of Weightage | | | | CO's Mapped |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | R | U | Ap | An | R | U | Ap | An | |
| 1 | Detailed estimate of R.C.C. elements | 06 | 06 | -- | 06 | -- | -- | -- | 2 | - | -- | CO1 |
| 2 | Estimation of quantity of steel in R.C.C. elements | 06 | 11 | -- | 03 | 08 | -- | -- | 1 | 1 | -- | CO1 |
| 3 | Detailed estimates of Roads and Culverts | 14 | 14 | -- | 06 | 08 | -- | -- | 2 | 1 | -- | CO2 |
| 4 | Detailed estimates of Irrigation and Public Health Engineering works | 14 | 14 | -- | 06 | 08 | -- | -- | 2 | 1 | -- | CO3 |
| 5 | Valuation of buildings | 12 | 14 | -- | 06 | 08 | -- | -- | 2 | 1 | -- | CO4 |
| 6 | Rent fixation | 8 | 11 | -- | 03 | 08 | -- | -- | 1 | 1 | | CO4 |
| | **Higher order question from any or combination of 1,2,3,4 Chapters** | | 10 | -- | -- | -- | 10 | -- | -- | -- | 1 | CO1,CO2 & CO3 |
| | **Total** | **60** | **80** | **--** | **30** | **40** | **10** | **--** | **10** | **5** | **1** | |

**TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TEST- I & II**

| Unit Test | Learning outcomes to be covered |
|---|---|
| Unit Test-I | From 1.1 to 3.2 |
| Unit Test-II | From 4.1 to 6.2 |

**Model Paper for Unit Test-I:**
**State Board of Technical Education and Training, A.P.**
**Diploma in Civil Engineering (DCE)**
**Fifth Semester: C-503 QUANTITY SURVEYING-II**

**Time: 90 Minutes** **Unit Test –I** **Maximum Marks: 40**

**PART- A** **16 Marks**

**Instructions:**

**(I) Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1. (i) If 'L' is length of the beam and 'd' is effective depth of the beam, then the length of $45^{o}$ cranked bar is_____ (CO1)
   (ii) The reinforcement in beam consists of Straight bar, Cranked bar and _____ (CO1)
   (iii) In WBM road the quantity of sub-grade and sub-base material is calculated based on compacted thickness (True/False) (CO2)
   (iv) The cement concrete laid in between the top of abutment and deck slab in slab culvert is called as_____ (CO2)
2. What is meant by 'bar bending schedule' and draw the format for bar bending schedule (CO1)
3. Calculate the weight of two-legged stirrup of 6 mm dia for a simply supported beam of size 300 mm x 450 mm. The concrete cover on all sides is 40 mm and the unit weight of the rod is 0.23 kg/m (CO1)
4. A cement-concrete pavement 150 mm thick and 6.20 m wide is laid over a base course 100 mm considering a length of 1200 m. Calculate the following quantities: (a) CC required for pavement (b) CC required for base course (CO2)
5. Prepare the detailed estimate of granular shoulders, on either side of the WBM road of 800 m. The width of shoulder is 1.00 m. The compacted thickness is 100 mm and loose thickness is 116 mm. (CO2)

**PART- B** **3 x 8 = 24 Marks**

**Instructions:**

**(i) Answer all questions**

**(ii) Each question carries EIGHT marks**

**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A) Prepare bar bending schedule of simply supported R.C.C. lintels from the following specifications:

   Size of the lintel 230mm wide and 200 mm depth.
   Main bars in the tension zone are of Fe415 grade, 3 bars of 12 mm dia., of which one is cranked through 45° at 180 mm from either end
   Nos. Anchor bars of 10mm dia. At top
   Two legged stirrups of 6 mm dia. @ 150 mm c/c

Clear span of the lintel is 1200 mm; bearing on either side is 200 mm

Weight of rods per metre: 12mm dia- 0.89 kg;
10 mm dia-0.617 kg;
6 mm dia- 0.23 kg (CO1)

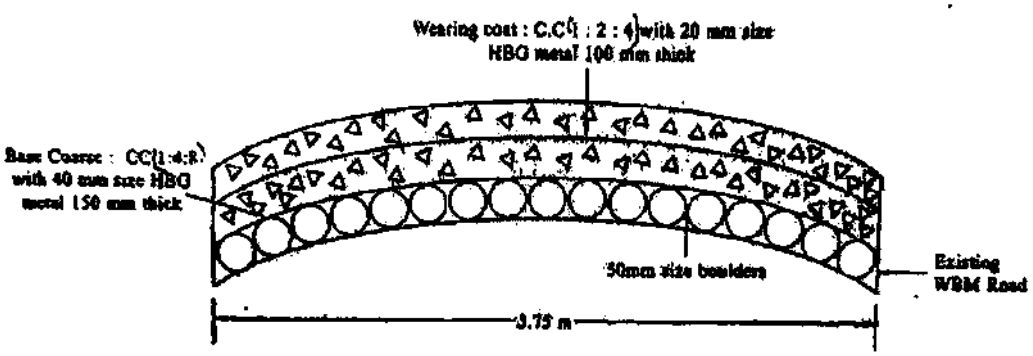
(OR)

(B) Prepare bar bending schedule of a simply supported R.C.C. Beam from the following specifications:

a) Clear span of the beam : 4000 m
b) Bearing on either side : 250 mm
c) Width of the beam : 230 mm
d) Overall depth of the beam : 400 mm
e) Bars in tension : 4 Nos. Of 20 mm dia.
vi) bars are cranked through 45° at a distance of 500 mm from either face of the supports
f) Bars in compression : 2 Nos. Of 16 mm dia.
g) Bottom clear cover : 25 mm
h) Top clear cover : 25 mm
i) Side clear cover : 25 mm
j) Two legged stirrups of 8 mm dia.@ 200 mm c/c
k) Weight/m: 20mm dia - 2.5 kg
16mm dia - 1.6 kg
8mm dia - 0.4 kg (CO1)

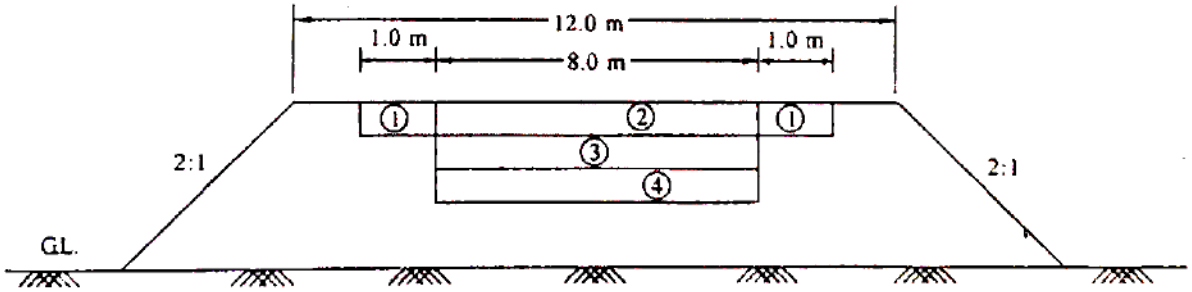
7. (A) Calculate the following quantities of WBM road shown in the following figure for a length of 1.50 km:

a) Collection and supply of 65 mm HBG for base course.
b) Collection and supply of gravel for base, berms and blindage for base course and wearing course. (CO2)



**(OR)**

(B) Prepare the detailed estimate of the following items of work for a water bound macadam road as shown in the figure given below for a length of 200 m: (a) Collection and supply of gravel for shoulders (b) Collection and supply of 65 mm HBG metal for base course (c) Spreading of 40 mm HBG metal for wearing course




W.B.M Road Section

vii) Gravel shoulders for a compacted thickness of 100 mm (loose thickness 150 mm)

(ii) 40 mm HBG to a compacted thickness of 100 mm (loose thickness 130 mm)

viii) 65 mm HBG metal to a compacted thickness of 120 mm (loose thickness 150 mm)

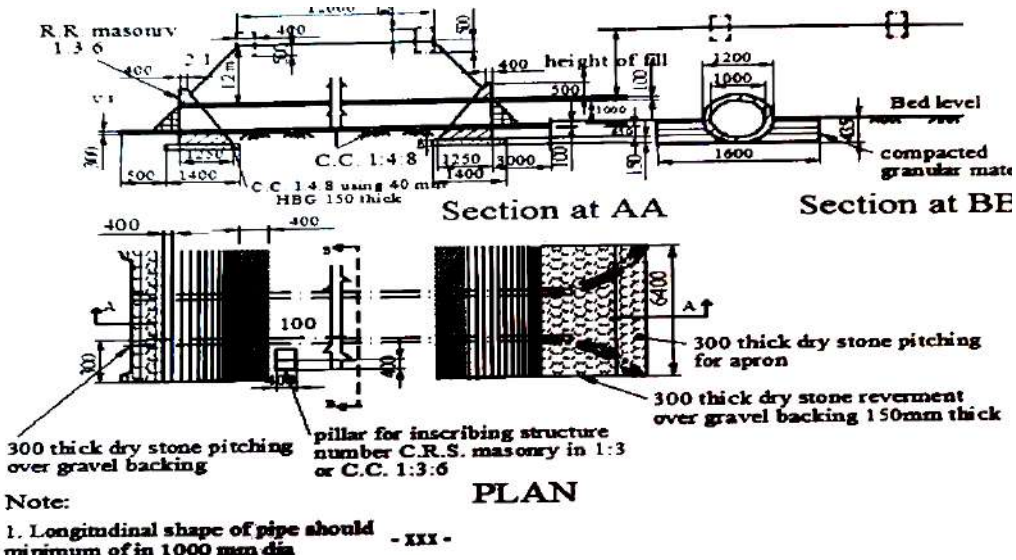
ix) Gravel base to a compacted thickness of 150 mm (loose thickness of 225 mm)

(CO2)

8. (A) Prepare the detailed estimate for the following items of work for a pipe culvert shown in the following figure

(a) CC (1:4:8) under head walls

(b) Compacted granular material for bedding and benching under pipe without deduction for pipe portion. (CO2)

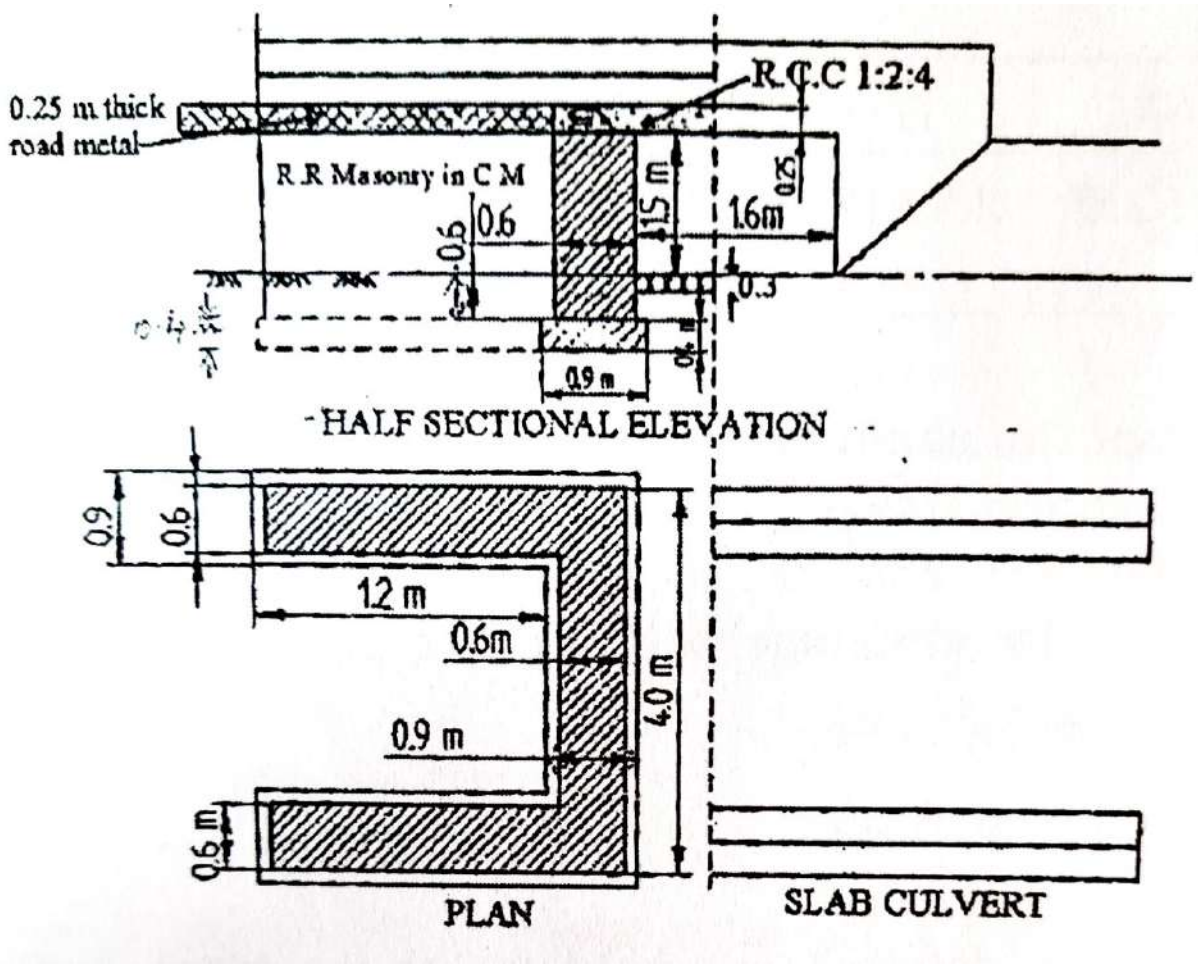


(OR)

(B) Prepare the detailed estimate for the following items of work for a slab culvert shown in the following figure:

(a) Earth work excavation for foundation for abutments and returns.

(b) CC (1:4:8) for abutment and returns (CO2)

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**Model Paper for Unit Test-II:**
**State Board of Technical Education and Training, A.P.**
**Diploma in Civil Engineering (DCE)**
**Fifth Semester: C-503 QUANTITY SURVEYING-II**

**Time: 90 Minutes** **Unit Test –II** **Maximum Marks: 40**

**PART- A** **16 Marks**

**Instructions:**

**(i)Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1. (a) The beam just below the bottom slab of the R.C.C. overhead tank is called____ (CO3)

   (b) The vertical R.C.C. sheet provided in septic tank is _____board (CO3)

   (c)The value of the property, which can be obtained by selling the property in the open market is known as _____value. (CO4)

   (d) The Net income = (Gross income) –(_____) (CO4)

2. List the component parts of septic tank (CO3)
3. List any three objectives of valuation. (CO4)
4. Explain the terms 'Scrap value' and 'Salvage value'. (CO4)
5. The cost of newly constructed building including all provisions is Rs.10,00,000/-. Calculate the monthly rent. If the reasonable interest on capital is 8%. (CO4)

**PART- B** **3 x 8 = 24 Marks**

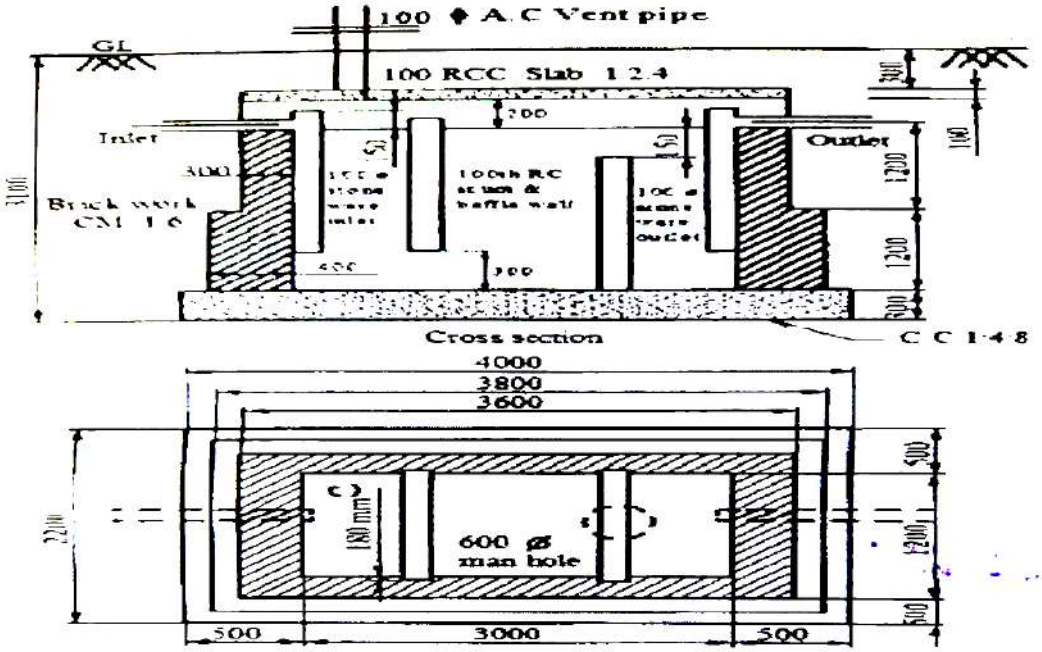
**Instructions:**

**(i) Answer all questions**

**(ii) Each question carries EIGHT marks**

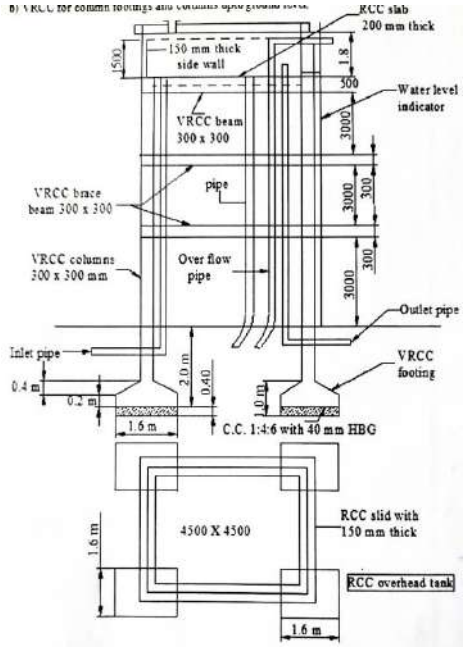
**(iii)Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A) Calculate the following quantities for a septic tank shown in the following figure:
   (i) Cement concrete (1:4:8) for foundation
   (ii) 2nd class brick work in CM (1:6) (CO3)




(OR)

(B) Prepare the detailed estimate for the following items of work for the R.C.C. overhead tank shown in the following figure (CO3)

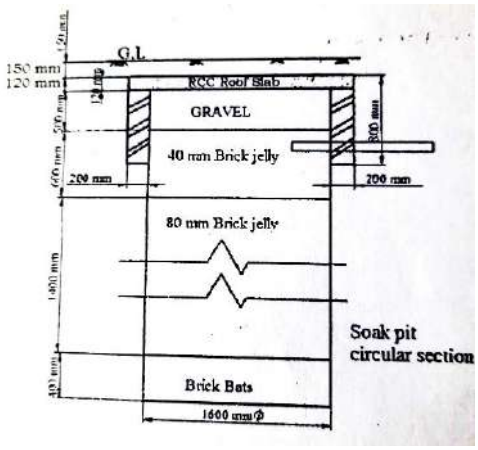



7. (A) The cross section of a soak pit is of 1.6 m diameter shown in the following figure. Prepare the detailed estimate of the following items of work:

(i) Earth work excavation for soak pit

(ii) Loose packing brick jelly 10 mm size.

(iii) R.C.C. (1:2:4) roof over soak pit (CO3)




**(OR)**

(B) A building of 250 sq. M plinth area is situated on a plot measuring 500 sq. M. The building is let out for a rent of Rs. 5,000/- per month. The cost of land is Rs.2800/- sq. M. The data pertaining to the outgoings are given below:
(i) Municipal taxes = 20% of gross rent
(ii) Repairs, maintenance, insurance expenses = 10% of gross rent.
(iii) Sinking fund is to be provided at 6% compound interest.
Calculate the capitalised value of the property for 6% net yield, assuming the useful life of the building as 75 years. Assuming the plinth area rate as Rs. 10,000/- per sq. M. (CO4)

8. (A) A residential building constructed 12 years ago is situated on a plot of area 500 sq. M. The plinth area of the building is 300 sq. M. The present cost of the construction of the building is Rs.3,30,000/-. The cost of the land is Rs.210/- per sq. M. The rate of depreciation for the building is 2.5%. Calculate the value of the property. (CO4)

(OR)

(B)A recently constructed building stands on a plot costing Rs.8,00,000/-. The construction cost of the building is Rs.15,00,000/- and the estimated life of the building is 75 years. The investor desires to have 9% return on the construction cost and 6% return on the cost of land. Assume annual repairs to be at 1% of cost of construction and other outgoings at 30% of the gross rent. Find the actual rent that will be charged for the building. Annual instalment of the sinking fund for a life of 75 year of the building 2.5% may be taken as ½ paise per rupee.
(CO4)

oOo

**Model Paper for End Examination:**

**MODEL PAPER – DIPLOMA EXAMINATION, (C–20)**

**DCE—FIFTH SEMESTER EXAMINATION**

**QUANTITY SURVEYING-II (C-503)**

**Time: 3 hours]** **[Total Marks: 80**

**PART—A** **3×10=30**

**Instructions (1) Answer all questions.**
**(2) Each question carries three marks.**
**(3) Answers should be brief and straight to the point and shall not exceed five simple sentences.**

1. An R.C.C. lintel of size 230 mm x 150 mm is provided over a door of size 1m x 2m, with bearings on either side of 200 mm. Calculate the quantity of R.C.C. in the lintel. (CO1)
2. A room of size 4m x 5m with wall thickness of 230 mm is provided with an R.C.C. roof slab of 150 mm thick. The slab is projected by 300 mm all-round the building. Calculate the quantity R.C.C. in slab. (CO1)
3. Calculate the length of a steel rod of 10mm dia. Used in one-way slab, given the clear span of slab is 3.20 m, width of supports is 230mm, thickness of slab is 130 mm and the rod is cranked on one side only. (CO1)
4. The head wall of the pipe culvert has a top width 0.50 m and bottom width 1.00 m. Calculate the net quantity of masonry in the head wall if the diameter of pipe is 1.20 m and height of head wall is 3.00 m. The length of head wall is 5.6m. (CO2)
5. A cement concrete pavement 150 mm thick and 6.20 m wide is laid over a base course 100 mm considering a length of 1200 m. Calculate the quantity of C.C. required for pavement (CO2)
6. The cross section of a circular well is shown in the fig.1, calculate the quantity of masonry in parapet wall.

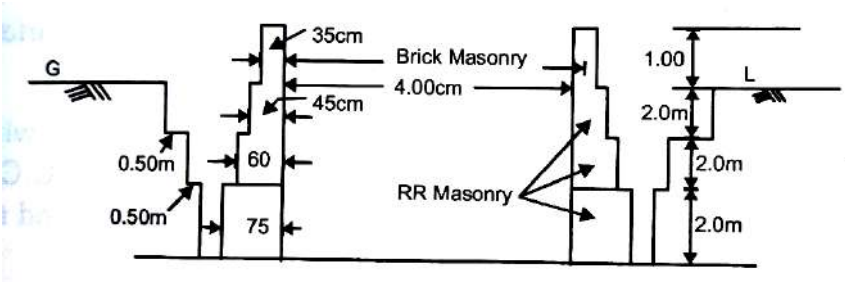



Fig.1 (CO3)

7. An R.C.C column footing of OHSR shown in fig.2, calculate the cement concrete quantity of the footing. (CO3)

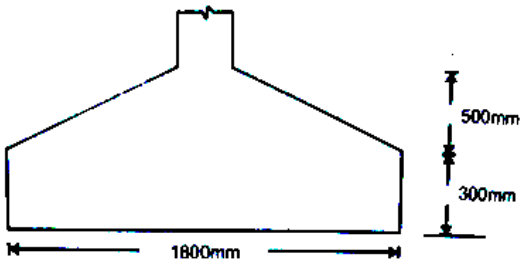



Fig.2

8. Define – Value, Cost and Price. (CO4)
9. State the methods of valuation. (CO4)
10. State any six outgoings to be considered during fixation of rent. (CO4)

**PART – B** **8 marks = 40marks**

**Answer either (A) or (B) from each questions from Part-B**

11. A) Prepare bar bending schedule of simply supported R.C.C. lintels from the following specifications:

Size of the lintel 230mm wide and 200 mm depth.

Main bars in the tension zone are of Fe415 grade, 3 bars of 12 mm dia., of which one is cranked through 45° at 180 mm from either end. 2 Nos. Anchor bars of 10mm dia. At top

Two legged stirrups of 6 mm dia. @ 150 mm c/c, Clear span of the lintel is 1200 mm; bearing on either side is 200 mm, Weight of rods per metre: 12mm dia- 0.89 kg; 10 mm dia-0.617 kg; 6 mm dia– 0.23 kg (CO1)

**(OR)**

B) Prepare the bar bending schedule and total weight of mild steel for R.C.C. beam shown in fig.3.

i. Main reinforcement of 22 mm dia 2 Nos. Straight bar at 29.8 N/m
ii. Bent up bars of 22 mm dia of 2 Nos. Of 29.8 N/m
iii. Anchor bars of 16 mm dia of 2 Nos.at top at 15.8 N/m
iv. Stirrups of 8 mm dia at 3.95 N/m (CO1)

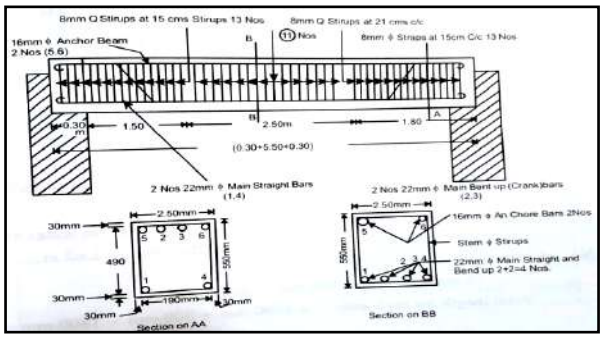



Fig.3

12. A) Prepare the detailed estimate for the cement concrete road of 1 km length with the following components (Fig.4)
    i. Base course of CC (1:4:8) with 40 mm size HBG metal 150 mm thick
    ii. Wearing coat with CC (1:2:4) with 20 mm size HBG metal 100 mm thick.

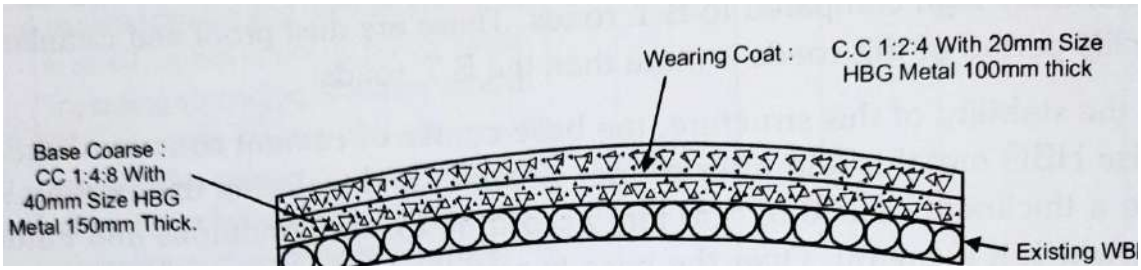



Fig.4 (CO2)

**(OR)**

B) Calculate the following quantities of WBM road shown in the fig.5 for a length of 1.50 km:
    i. Collection of 65 mm HBG for base course.
    ii. Spreading of 40 mm HBG for wearing course.

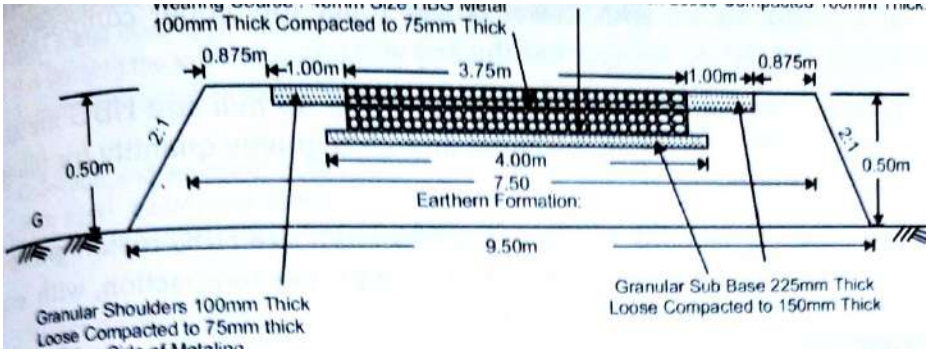



Fig.5 (CO2)

13. A) Calculate the following quantities of an open well shown in fig.6

i. Quantity of earthwork excavation in 1st, 2nd and 3rdmattus.

ii. Quantity of masonry in 3rd and 4thmattus.

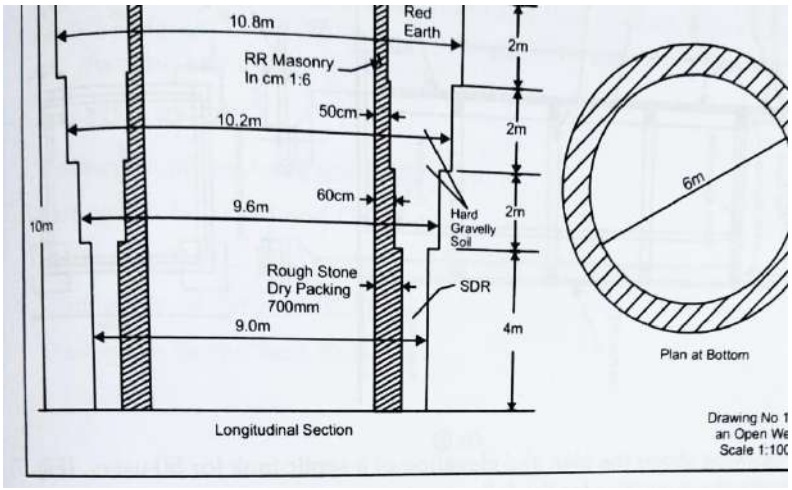



Fig.6 (CO3)

**(OR)**

B) Calculate the following quantities of an R.C.C overhead tank shown in the fig.7

i. R.C.C (1:2:4) for columns up to the bottom of ring beam

ii. R.C.C. (1:2:4) for side walls

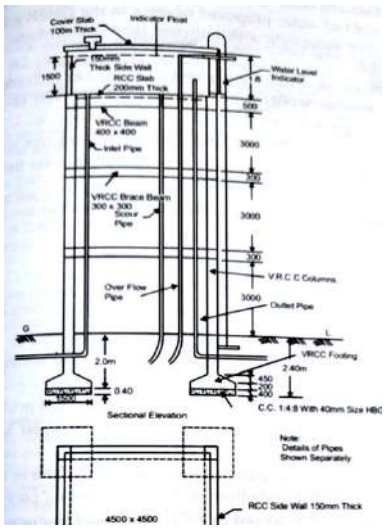



Fig.7 (CO3)

14) (A) A building in an A class city is let out @ Rs. 5000/- per month. The total outgoings of the property is estimated to be 15% of the gross income, calculate the capitalized value of the property if the present rate interest is 6% and life of the property is 50 Years. (CO4)

**(OR)**

(B) A residential building constructed 15 years ago is situated on a plot of area 600 sq. M. The plinth area of the building is 350 sq. M. The present cost of the construction of the building is Rs.3,30,000/-. The cost of the land is Rs.240/- per sq. M. The rate of depreciation for the building is 3.0%. Calculate the value of the property. (CO4)

15. (A) A recently constructed building stands on a plot costing Rs.12,00,000/-. The construction cost of the building is Rs.18,00,000/- and the estimated life of the building is 60 years. The investor desires to have 8% return on the construction cost and 6% return on the cost of land. Assume annual repairs to be at 2% of cost of construction and other outgoings at 30% of the gross rent. Find the actual rent that will be charged for the building. Annual instalment of the sinking fund for a life of 60 year of the building 2.5% may be taken as ½ paise per rupee. (CO4)

(OR)

(B) Explain the principles of rent fixation by CPWD. (CO4)

**PART – C**

**Question No.16 is compulsory and carries 10 marks**

16. For a R.C.C. slab culvert as shown in fig.8, calculate
    i. Earth work for foundation for abutments and return walls.
    ii. Stone masonry in CM (1:6) upto bottom of deck slab

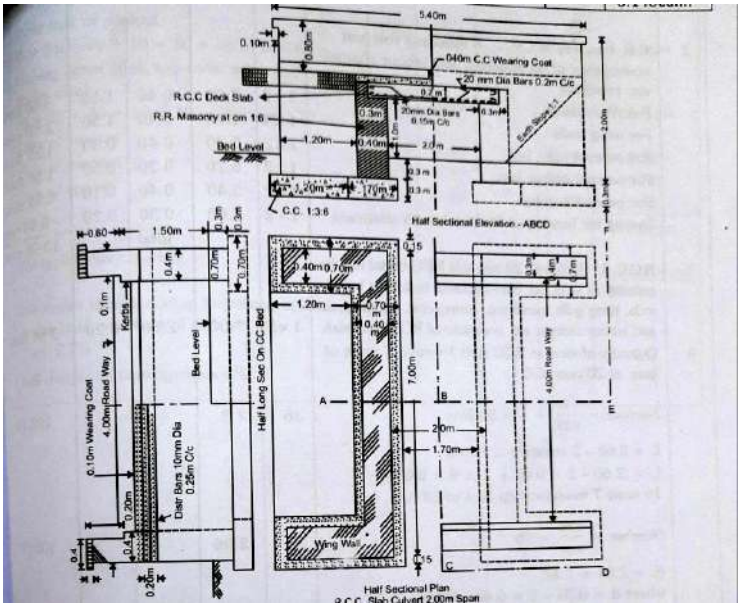



Fig.8 (CO2)

***

# CONSTRUCTION FAILURES, REPAIRS AND MAINTENANCE

| Course code | Course title | No. Of period/week | Total no. Of periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-504 | CONSTRUCTION FAILURES, REPAIRS AND MAINTENANCE | 03 | 45 | 20 | 80 |

| S.No. | Major Topics | No. Of periods/week | CO's Mapped |
|---|---|---|---|
| 1. | Introduction | 4 | CO1 |
| 2. | Subsurface construction failures and repairs | 10 | CO1 |
| 3. | Surface construction failures and repairs | 6 | CO2 |
| 4. | Masonry and concrete failures, repairs | 9 | CO3 |
| 5. | Manmade and Natural failures, rehabilitation | 6 | CO4 |
| 6. | Maintenance problems and their solutions | 10 | CO5 |
| | Total Periods | 45 | |

**COURSE OBJECTIVES:**

| **Upon completion of the course the student shall be able to** | | |
|---|---|---|
| **Course Objectives** | (i) | Understand the methods of identifying failures and their causes in various types of construction. |
| | (ii) | Learn the necessary repairs for various failures observed in construction. |
| | (iii) | Learn the maintenance procedures of a construction to keep it safe and durable. |

**COURSE OUTCOMES*:***

| | | | |
|---|---|---|---|
| **Course Outcomes** | CO1 | C-504.1 | Analyse the causes of failuresin foundations and repairs involved, sub surface construction failures and repairs |
| | CO2 | C-504.2 | Analyse(i) surface construction failures (ii) failures in retaining wall and abutments and repairs involved in rectifying these failures. |
| | CO3 | C504.3 | Explain the types of failures in masonry and concrete and their repairs |
| | CO4 | C504.4 | Analyse(i) failures due to manmade and natural disasters (ii)ignorance and negligence and preventive methods to overcome these failures |
| | CO5 | C504.5 | Explain (i) Defects in buildings (ii) Dampness control (iii) Causes, preventive and corrective methods of cracks in buildings, (iv) method of maintenance of roads, canal linings, leak proofing of R.C.C. roofs with chemicals. |

**LEARNING OUTCOMES:**

| | | |
|---|---|---|
| **Learning Outcomes** | **1.0** | **Introduction** |
| | 1.1 | Define<br>1. Error,<br>2. Defect and<br>3. Failure |
| | 1.2 | State different types of errors causing failures. |
| | 1.3 | State the causes of failures. |
| | **2.0** | **Understand subsurface construction failures and repairs** |
| | 2.1 | Describe construction failures in foundations due to Under mining safe support, Load transfer failure, Lateral movement, Unequal support, settlement and differential settlement, Uplift in expansive soils, Design error, Construction error, flotation and water change, vibration effect, earthquake effect. |
| | 2.2 | Describe the repairs involved for rectifying the above failure. |
| | 2.3 | Describe Sub surface construction failures, Trenches, sheeting and bracing, piles and caissons, Sewer and tunnels, dams. |
| | 2.4 | Describes the repairs involved for rectifying the above failures. |
| | 2.5 | Examine case studies |
| | **3.0** | **Understand Surface construction failures and repairs** |
| | 3.1 | Describes the failures in surface construction,Slopes and slides,Subsidence,failureof retaining walls and abutments |
| | 3.2 | Describes the repairs involved for rectifying the above failures. |
| | 3.3 | Examine case studies |

| | |
|---|---|
| | **4.0 Understand Masonry and concrete failures, repairs**<br>4.1 Describe types of failures in masonry, Wall failure, construction error, aging, joints and cracks, weather tightness, masonry cladding, partitions, ornamental screens, plaster.<br>4.2 Explain the repairs involved for rectifying the above failures.<br>4.3 Explain the types of failures in concrete due to Improper mix design, curing, placement of reinforcement, Rusting of embedded steel, handling of pre cast elements, shrinkage, expansion and plastic changes, surface disintegration due to fire, spalling of concrete, compression failure, erection difficulty, temperature change, Deformation and cracking.<br>4.4 Explain the repairs involved for rectifying the above failure and use of expansion filler.<br>4.5 Examine case studies<br>**5.0 Understand Manmade and natural failures and repairs**<br>5.1 Describe the types of failures in manmade and natural disasters due to Demolition, deterioration, overload, alteration collapses, fire, explosion and vibration, collision, wind damages, towers and masts, storm at sea, storm on land, lightening damage, rain-ponding effect<br>5.2 Explain the repair's involved for rectifying the above failure.<br>5.3 Describe the failures due to ignorance and negligence, incompetence, control and supervision, responsibility.<br>5.4 Explain the repairs involved for rectifying the above failures.<br>5.5 Examine case studies<br><br>**6.0 Understand the Maintenance problems and their solutions**<br>6.1 Describes the list of defects in buildings bringing out the investigation and remedial details.<br>6.2 State the methods of solving dampness problems in buildings.<br>6.3 Explain the causes, preventive and corrective methods of cracks in building.<br>6.4 Explain the maintenance operations for the Water supply and sanitary components of building.<br>6.5 Explain the methods of maintenance of roads / road berms / side drains.<br>6.6 Explain methods of repairs to canal linings.<br>6.7 Use of Leak proof chemicals for R.C.C roofs. |

**PO-Cos Mapping:**

| **Course** Code: C-504 | **Course Title:** Construction failures, repairs and maintenance **Number of Cos: 5** | | | | **No. Of periods: 45** |
|---|---|---|---|---|---|
| **Pos** | **Mapped with CO No** | **CO Periods Addressing PO in Col 1** | | **Level (1,2,3)** | **Remarks** |
| | | **No** | **%** | | **>40% Level 3 (Highly Addressed)** |
| PO1 | CO1,CO2,CO3,CO4,CO5 | 12 | 27 | 2 | 25% to 40% Level 2 (Moderately Addressed) |
| PO2 | CO1,CO2,CO3,CO4,CO5 | 18 | 40 | 3 | 5% to 25% Level 1( Low Addressed) |
| PO3 | CO1,CO2,CO3,CO4,CO5 | 15 | 33 | 2 | <5% Not Addressed |
| PO4 | | | | | |
| PO5 | | | | | |
| PO6 | | | | | |
| PO7 | | | | | |

**CO-PO Mapping:**

| CO No. | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 2 | | | | | 2 | 2 | 3 |
| CO2 | 2 | 2 | 3 | | | | | 2 | 3 | 3 |
| CO3 | 3 | 2 | 3 | | | | | 2 | 2 | 3 |
| CO4 | 3 | 2 | 2 | | | | | 2 | 3 | 3 |
| CO5 | 2 | 2 | 2 | | | | | 2 | 2 | 3 |
| Average | 2.4 | 2 | 2.4 | | | | | 2 | 2.4 | 3 |

**Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**

**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz**

**(vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc**

**COURSE CONTENT**

**1. Introduction**

Definition of error, defect, and failure – Causes of failures.

2. **Sub-surface construction failures and repairs**

Failures in Foundations – Under mining – Load transfer failures – Lateral movement – Unequal support – Settlement and Differential Settlement – Uplift in expansive soils compression failure, erection difficulty, temperature change, Deformation and cracking – Drag down and heave – Design error – Construction error – Flotation and water change – Vibration effect – Earthquake effect – repairing techniques to be adopted-Failures during excavation – Sheeting and bracing – piles and caissons – sewers and tunnels – measures to be taken- Case Studies

**3. Surface construction failures and repairs**

Earthen bunds – failures – slope failures and sliding – subsidence – measures to be taken to prevent surface construction failures – measures to be taken – retaining walls and abutments – geo-membranes – Revetment and pitching- Case Studies.

**4. Masonry and concrete failures, repairs**

Wall failures – Construction error – Aging – Joints and cracks – Water tightness – Masonry cladding – Partitions – Ornamental screens – Plastering failures – repairs-Concrete failures – Improper mix design, curing, placement of reinforcement and handling of pre cast elements – shrinkage failures – expansion and plastic changes – surface disintegration due to fire – spalling of concrete – repairs- Case Studies

**5. Man-made and natural failures, rehabilitation**

Demolition – Deterioration – Overload – Alteration collapses – Fire – Explosion and Vibration – Collision – wind damages of towers and masts – Storm at sea – Storm on Land – Lighting damage – rain-ponding – effects – rehabilitation measures- Case Studies

**6. Maintenance problems and their solutions**

Water proofing, leakage of basements and roofs – Treating dampness in walls – Omission of DPC – Window sills, down pipes and other areas of damp penetration – Cico water proofing-Cracks in walls – Horizontal, Vertical, diagonal – causes and prevention of cracks in buildings – Care of floors, removing stains from floors – Inks, rust, oil, paint and varnish-Maintenance problems of plumbing, heating, hot water supply, clogged drains, sewers, leaking pipe joints, electrical installations, other building services, septic tanks and soak pits-Maintenance of roads, road-berms and side drains-Strengthening of canals, embankments, silt clearance weed removal, repairs to canal lining-Leak proofing of water tanks and roofs use of chemicals for RCC roofs.

## REFERENCE BOOKS:


1. Construction Failure ,by Jacob Feld , Kenneth L. Carper, John Wiley & Sons Publications
2. Failures & Repairs of Concrete Structures, S. Champion, John Wiley & Sons Publications
3. Engineering Structural Failures,RoltHammond,Odham Press, London
4. Learning from Failures: Deficiencies in Design, Construction and Service,R.N.Naika,R &D Centre, Structwel Designers & Consultants
5. Building Failures Diagnosis and Avoidance,W.H.Ransom,Routledge Publications
6. Maintenance Engineering for Civil Engineers,NayakB.S.,Khanna Publishers
7. Repair and Rehabilitation Of Concrete Structures,Modi I Poonam,Chirag N Patil, PHI Learning Pvt Ltd
8. Maintenance, Repair & Rehabilitation & Minor Works of Buildings,P.C.Varhese, Prentice Hall India Learning Private Limited

9.SP: 25-1987 : Causes and prevention of cracks in buildings,BIS, New Delhi

**MODEL BLUE PRINT**

| S.No. | Chapter Name | Periods allocated | Weightage allotted | Mark wise Distribution of Weightage | | | | Question wise Distribution of Weightage | | | | Linked with CO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | R | U | Ap | An | R | U | Ap | An | |
| 1. | Introduction | 4 | 03 | 3 | | | | 1 | | | | CO1 |
| 2. | Subsurface construction failures and repairs | 10 | 14 | 3 | 3 | | 8 | 1 | 1 | | 1 | CO1 |
| 3. | Surface construction failures and repairs | 6 | 11 | 3 | | | 8 | 1 | | | 1 | CO2 |
| 4. | Masonry and concrete failures, repairs | 9 | 14 | 3 | 3 | | 8 | 1 | 1 | | 1 | CO3 |
| 5. | Manmade and Natural failures, rehabilitation | 6 | 14 | 3 | 3 | | 8 | 1 | 1 | | 1 | CO4 |
| 6. | Maintenance problems and their solutions | 10 | 14 | 3 | 3 | | 8 | 1 | 1 | | 1 | CO5 |
| | **Higher order question from any or combination of the chapters 1,2,3,5** | | 10 | | | | 10 | | | | 1 | CO1, CO2, CO4 |
| | Total | 45 | 80 | 18 | 12 | | 50 | 6 | 4 | | 5 | |

**Table specifying the scope of syllabus to be covered for Unit Test-I & Unit Test-II**

| Unit Test | Learning Outcomes to be covered |
|---|---|
| Unit Test – I | From 1.1 to 3.3 |
| Unit Test – II | From 4.1 to 6.7 |

**Model Paper for Unit Test-I :**
**State Board of Technical Education and Training, A.P.**
**Diploma in Civil Engineering (DCE)**
**Fifth Semester ::C-504 CONSTRUCTION FAILURES,REPAIRS AND MAINTAINANCE**

**Time: 90 Minutes** **Unit Test –I** **Maximum Marks : 40**

**PART- A** **16 Marks**

**Instructions:**

**(I) Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1. (a) Failures are defined as behaviour not in agreement with the expected conditions of stability – True/False (CO1)
   (b) Prior to the excavation for foundation of a building the foundation of adjacent building must be provided with temporary shoring – True/False (CO1)
   (c) Any condition or characteristic that detracts from the appearance, strength, or durability of an object is known as ---------- (CO1)
   (d) Retaining walls are required to resist ... pressure. (CO2)
2. Briefly explain the need to identify the errors in constructions? (CO1)
3. State any six types of foundation failures. (CO1)
4. State causes of slides in slopes. (CO2)
5. What are the causes for failure of embankments? (CO2)

**PART- B** **3 x 8 = 24 Marks**

**Instructions :**

**(i)Answer all questions**

**(ii) Each question carries EIGHT marks**

**(iii)Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A) Describe the causes for the Foundation failure due to the undermining of safe support.(CO1)

(OR)

(B) Explain the foundation failure due to the Load transfer failure. Suggest remedies. (CO1)

7. (A) Explain various causes for settlement of Foundations and suggest remedial measures. (CO1)

(OR)

(B) Describe the failures encountered in Tunnelling and how to overcome them ? (CO1)

8. (A) Explain the failures in Retaining walls and mention the remedies to prevent them. (CO2)

(OR)

(B) Describe some case studies of failures in surface constructions. (CO2)

oOo

**Model Paper for Unit Test-II**
**State Board of Technical Education and Training, A.P.**
**Diploma in Civil Engineering (DCE)**
**Fifth Semester ::C-504 CONSTRUCTION FAILURES,REPAIRS AND MAINTAINANCE**

**Time: 90 Minutes** **Unit Test –II** **Maximum Marks : 40**

**PART- A** **16 Marks**

**Instructions :**
**(I) Answer all questions**
**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1. (a) Water is the most essential element required in construction of a building; again water or moisture is the most harmful element for causing damage to a building – True/False (CO3)
   (b) Explosive demolition is the preferred method for safely and efficiently demolishing larger structures – True/False (CO4)
   (c) We know that efflorescence is a fine, white, powdery deposit of water-soluble salts left on the surface of masonry as the water evaporates .. (CO3)
   (d) ..... are the small depressions in the floors, formed during flooring. (CO5)
2. List the cause of failures of masonry walls ? (CO3)
3. What is spalling of concrete ? State the reason for this problem. (CO3)
4. State the failures that occur due to man made mistakes ? (CO4)
5. Briefly explain the method of removing stains from floors. (CO5)

**PART- B** **3 x 8 = 24 Marks**

**Instructions :**
**(ii) Answer all questions**
**(ii) Each question carries EIGHT mark**
(iii) **Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer**.

6. (A) Describe the failures in masonry due to (i) aging (ii) joints and cracks (CO3)

   (OR)

   (B) Describe the failures in concrete due to shrinkage and expansion. (CO3)

7. (A) Explain the failures due to structures due to (i) deterioration (ii) overload and also state the preventive methods (CO4)

   (OR)

   (B) Describe how ignorance and negligence lead to the failure of structures. (CO4)

8. (A) Explain the methods of solving dampness problems in buildings. (CO5)

   (OR)

   (B) Explain methods of repairs to canal linings. (CO5)

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**Model Paper for End Examinations:**

**MODEL PAPER – DIPLOMA EXAMINATION, (C–20)**

**DCE—FIFTH SEMESTER EXAMINATION**

**CONSTRUCTION FAILURES, REPAIRS AND MAINTENANCE (C-504)**

**TIME : 3 Hours** **MAX MARKS : 80**

**PART—A** **3×10=30**

**Instructions:(1) Answer all questions.**

**(2) Each question carries three marks.**

**(3) Answers should be brief and straight to the point and shall not exceed five simple sentences.**

| | | |
|---|---|---|
| 1) | Define error and failure | (CO1) |
| 2) | State three construction failures in foundations. | (CO1) |
| 3) | Define (i) Pile (ii) Caisson. | (CO1) |
| 4) | State the common failures in subsurface constructions. | (CO2) |
| 5) | State the reasons for wall failures. | (CO3) |
| 6) | State the failures due to the mistakes in concrete operations. | (CO3) |
| 7) | State the manmade failures in constructions. | (CO4) |
| 8) | List the natural failures in constructions. | (CO4) |
| 9) | State defects in buildings needed maintenance. | (CO5) |
| 10) | State the types of canal linings. | (CO5) |

**PART – B** **5 x 8 marks = 40marks**

**Answer either (A) or (B) from each questions from Part-*B***

11) (A) Describe the foundation failures due to Undermining safe support. (CO1)

**(OR)**

(B) Explain the Sub surface construction failures in Trenches. (CO1)

12) (A) Describe the Subsidence of retaining walls and abutments. (CO2)

**(OR)**

(B) Explain the failures in slopes and slides and also suggest remedial measures?(CO2)

13) (A) Explain the failures in constructions due to deformation and cracking and suggest remedial measures. (CO3)

**(OR)**

(B)Describe the types of failures in masonry of buildings. (CO3)

14) (A) Describe the failures in constructions due to ignorance and negligence. (CO4)

**(OR)**

(B)Explain the failures due to Demolition & deterioration and suggest preventive measures. (CO4)

15) (A) Explain the methods of solving dampness problems in buildings. (CO5)

**(OR)**

(B)Describe the repairs for leaking R.C.C roofs using chemicals. (CO5)

**PART – C**

**Question No.16 is compulsory and carries 10 marks**

16) Explain the maintenance operations for the Water supply and sanitary components of building. (CO5)

***

# QUALITY CONTROL AND SAFETY IN CONSTRUCTION

| Course code | Course title | No. Of period/week | Total no. Of periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-505 | Quality Control and Safety in Construction | 04 | 60 | 20 | 80 |

| S. No. | Major Topics | No. Of periods | Cos Mapped |
|---|---|---|---|
| 1 | Specifications and Standards | 12 | CO1 |
| 2 | Quality control, Statistical Analysis and Tolerance | 12 | CO2 |
| 3 | Introduction to safety in construction Activities | 08 | CO3 |
| 4 | Causes of Accidents and Safety Measures | 22 | CO4 |
| 5 | Preventive measures for Accidents | 06 | CO4 |
| | **Total** | **60** | |

**COURSE OBJECTIVES:**

| Upon completion of the course, the student shall be able to | | |
|---|---|---|
| **Course Objectives** | (i) | Understand the fundamentals of quality control in construction |
| | (ii) | Familiarize with the fundamentals of safety aspects and preventive measures of accidents in construction |

**COURSE OUTCOMES*:***

| | | | |
|---|---|---|---|
| **Course Outcomes** | CO1 | C505.1 | Explain the specifications and standards for various works |
| | CO2 | C505.2 | Analyse the aspects of quality control, statistical analysis and tolerance limits for different types construction activities. |
| | CO3 | C505.3 | Analyses the safety measures to be taken in constructions |
| | CO4 | C505.4 | Analyse the causes and preventive measures of accidents |

**LEARNING OUTCOMES:**

| | |
|---|---|
| **LEARNING OUTCOMES** | **1.0 Specifications and standards**<br>1.1 List different specifications of buildings.<br>1.2 Explain functional aspects of different structures.<br>1.3 Describe detailed specification for various items of work.<br>1.4 Prepare detailed specification from general description.<br>1.5 List relevant IS codes.<br>1.6 Identify sizes for building components and Identify the standards.<br>1.7 Understand standards for industrial buildings.<br>1.8 Explain Management aspects of quality control.<br>1.9 Describe Advisory Organization, Describe Management Functions and Regulations.<br>1.10 State PWD & CPWD Guidelines for field officers.<br>2.0 **Quality control, Statistical Analysis and Tolerance**<br>2.1 Describe control aspects of batching and mixing.<br>2.2 Explain the inspection of reinforcement grills.<br>2.3 Explain the inspection and examination of formwork.<br>2.4 Describe the quality of the filler materials.<br>2.5 Establish relationship between the strength of brickwork and strength of mortar.<br>2.6 Describe Mathematical probability.<br>2.7Explain sampling plan and sampling risks of acceptance and rejections.<br>2.1 State the tolerance levels in construction industry.<br>2.10 Explain visual appearance and dimensional accuracies.<br>**3.0 Introduction to safety in construction Activities**<br>**3.1** Describe the safety requirements against fire hazards<br>**3.2** Describe the safety measures while using construction machinery<br>**3.3** Describe the safety precautions to be taken during the demolition of buildings<br>**3.4** Describe the preventive methods of accidents |

| | |
|---|---|
| | **4.0 Causes of Accidents and Safety Measures**<br>**4.0** Define accidents, List the causes of accidents.<br>**4.1** Explain role of loss control approach in the cost of the accidents.<br>**4.2** Describe the cost aspects of accidents and measures.<br>**4.3** Describe the General safety program, Prepare accidents reports<br>**4.4** Describe the safety measures to be taken for storage and handling of building materials.<br>**4.5** Describe the safety requirements in formwork and scaffolding.<br>**4.6** Explain the safety measures to be taken in excavation & pile driving in foundation.<br>**4.7** Describe the safety measures to be taken in construction of building elements.<br>**4.8** Describe the safety measures to be taken in demolition of buildings.<br>**4.9** Describe the safety measures to be taken for hot bituminous works.<br>**4.10** Describe the safety measures to be taken in supporting structural work.<br>**5.0 Preventive measures for accidents**<br>**5.0** Define 1. Risk and 2. Risk management.<br>**5.1** Explain the role of risk management.<br>**5.2** Describe the planning for accident prevention.<br>**5.3** Evaluate risks and losses and cost control works<br>**5.4** Describe the management measures for controlling losses |

**PO –CO Mapping:**

| Course Code : C-505 | Course Title: Quality Control and Safety in Construction Number of Cos: 04 | | | | No. Of Periods: 60 |
|---|---|---|---|---|---|
| PO # | Mapped with CO # | CO Periods addressing PO in Column 1 | | Level (1,2,3) | Remarks |
| | | No | % | | |
| PO1 | CO1,CO2, CO3,C04 | 24 | 40 | 2 | > 40% Level 3 Highly addressed |
| PO2 | CO1,CO2,CO3,CO4 | 24 | 40 | 2 | |
| PO3 | | | | | |
| PO4 | | | | | 25% to 40% Level 2 Moderately addressed |
| PO5 | | | | | |
| PO6 | | | | | |
| PO7 | CO1,CO2, CO3,CO4 | 12 | 20 | 1 | 5 to 25% Level 1 Low addressed |

**CO-PO Mapping:**

| CO No. | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | | | | | 3 | 3 | 1 | 1 |
| CO2 | 2 | 3 | | | | | 2 | 2 | 2 | 1 |
| CO3 | 2 | 3 | | | | | 2 | 3 | 1 | 1 |
| CO4 | 2 | 2 | | | | | 2 | 2 | 2 | 1 |
| **Average** | **2.25** | **2.5** | | | | | **2.25** | **2.5** | **1.5** | **1** |

**Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**

**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz**

**(vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc**

**COURSE CONTENT**

1) **Specifications and Standards**

Specification for buildings – functional aspects of residential, commercial and industrial structures – Detailed Specifications for various items of work – preparation of detailed specification from general description – Modular Coordination – relevant IS codes – Preferred size for building components – Performance standards – Standards for industrial buildings-Management aspects of quality control – advisory organization management functions – Statutory regulations – State PWD & CPWD guide lines for field officers.

2) **Quality control, Statistical Analysis and Tolerance**

Production & quality control of concrete – general – batching – mixing – inspection of reinforcement grill and form work-Quality control in Masonry works – quality of filler materials – Brick – stone – quality of mortar – relation between strength of brick work Vs strength of bricks Vs strength of mortar-Statistical basis for modern quality control – Simple examples of mathematical probability – Sampling plan – Sampling risks of acceptance and rejection-Tolerance levels in construction industry – Visual appearance – dimensional accuracies.

3) **Introduction to safety in construction Activities**

Introduction – safety against fire hazards – Fire & fire fighting – Fire rating of building materials – fire prevention standards – safety in use of construction machinery – lifting machinery, earth moving machinery and conveyors, demolition of buildings – Loading standards for buildings – The safety programme – Accident due to fall – preventive methods.

4) **Causes of Accidents and Safety Measures**

Causes of accidents – Classification of construction accidents – Cost of accidents – loss control approach in the cost of accidents – measurement of accidents – Salient features of 'A safety programme' – General safety programmes for construction – Accident report-Safety Measure for storage & handling of building materials – Safety Measure in construction of elements of building – Safety in excavation & pile driving –foundations – form work – scaffolding – roofing – safety on fragile roof – other items of work – Safety Measure in demolition of buildings – Safety Measure for hot bituminous works – Safety Measure for scaffolding, Ladders, formwork and other equipment – erection of prefabricated components and transportation – erection of steel structures – Safety measures for excavation.

5) **Preventive measures for Accidents**

Planning for accident prevention – Evaluation of risk and loss potential in the work. Vis-a-vis cost control measures – loss control approach through accident prevention and other risk management measures for controlling losses due to personnel, legal, liability losses – property losses.

**REFERENCES*:***


1. Specification Writing,A.J and C.J.Willis, Crossby Lockwood, London
2. Quality Control and Reliability ,Norbert L Enrick , Industrial Press Inc.,NY
3. Standards in Buildings ,R.Nagarajan,Pitman publishing
4. Safety in Construction Industry,VincentG.Bush, OSHA
5. Safety in Construction Industry ,S.Purushotham&G.Vaidyanathan, Central Labour Institute, Bombay
6. Accident Prevention in Construction, Associated General Contractors of America:
7. Standards on safety ,BIS, New Delhi.

**MODEL BLUE PRINT**

| S. No | Major Topics | No. Of periods | Weightage of marks | Marks wise Distribution of Weightage | | | | Question wise Distribution of Weightage | | | | Cos Mapped |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | R | U | Ap | An | R | U | Ap | An | |
| 1 | Specifications and Standards | 12 | 09 | 09 | -- | -- | -- | 3 | - | - | -- | CO1 |
| 2 | Quality control, Statistical Analysis and Tolerance | 12 | 14 | -- | 14 | -- | -- | -- | 3 | -- | -- | CO2 |
| 3 | Introduction to safety in construction<br>Activities | 08 | 11 | -- | 11 | -- | -- | -- | 2 | -- | -- | CO3 |
| 4 | Causes of Accidents and Safety Measures | 22 | 22 | 06 | 16 | -- | -- | 2 | 2 | -- | -- | CO4 |
| 5 | Preventive measures for Accidents | 06 | 14 | 06 | 08 | -- | -- | 2 | 1 | -- | -- | CO4 |
| | **Higher order question from any or combination of 2,3,4 & 5Chapters** | -- | 10 | -- | -- | -- | 10 | -- | -- | -- | 1 | CO2, CO3& CO4 |
| | Total | 60 | 80 | 18 | 52 | -- | 10 | 7 | 8 | -- | 1 | |

**Table specifying the scope of syllabus to be covered for Unit Test-I & Unit Test-II**

| Unit Test | Learning Outcomes to be covered |
|---|---|
| Unit Test – I | From 1.1 to 3.3 |
| Unit Test – II | From 3.4 to .5 |

**Model Paper for Unit Test-I :**
**State Board of Technical Education and Training, A.P.**
**Diploma in Civil Engineering (DCE)**
**Fifth Semester ::C-505 Quality Control and Safety in Construction**

**Time: 90 MinutesUnit Test –IMaximum Marks : 40**

**PART- A 16 Marks**

**Instructions :**

**(i) Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1. (a) specification is so important to the construction process:. – True/False (CO1)

   (b) Quality control is not essential to meet customers' expectations–True/False (CO2)

   (c) The quantity of Half brick wall is specified in ---------- (CO1)

   (d) For walls, columns and vertical faces of all structural members, the form work is generally removed after _____hours (CO2)

2. Mention different specifications of buildings? (CO1)

3. List three relevant IS codes for specifications of materials. (CO1)

4. Describe briefly the quality of filler material. (CO2)

5. State the significance of Mathematical Probability in quality control? (CO3)

**PART- B 3 x 8 = 24 Marks**

***Instructions :***

**(i) Answer all questions**

**(ii) Each question carries EIGHT mark**

**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A) Describe detailed specification for various items of work . (CO1)

   (OR)

   (B) Explain the standards of industrial buildings . (CO1)

7. (A) Describe the quality control aspects of batching and mixing of concrete . (CO2)

   (OR)

   (B) Explain the points to be considered in the inspection of Formwork? (CO2)

8. (A) Describe the role of statistics in the modern quality control with examples. (CO3)

   (OR)

   (B) Explain the sampling risks of acceptance and rejections. (CO3)

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**Model Paper for Unit Test-II :**
**State Board of Technical Education and Training, A.P.**
**Diploma in Civil Engineering (DCE)**
**Fifth Semester ::C-505 Quality Control and Safety in Construction**

**Time: 90 MinutesUnit Test –II Maximum Marks : 40**

**PART- A 16 Marks**

***Instructions :***

**(I) Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1. (a) Tolerances in construction are generally a variation in a dimensions. – True/False (CO3)
   (b) Sometimes it is necessary to break a part of the casting to take measurements of inside dimensions properly-- True/False (CO3)
   (c) The basic things the construction worker should wear for protection are ---------- (CO3)
   (d) Accidents are investigated to avoid ..... (CO4)
2. Mention the tolerance levels for measuring equipment for batching plant ? (CO3)
3. State three preventive measures for fire accidents. (CO3)
4. List three causes for construction accidents. (CO4)
5. What is loss control approach ? (CO4)

**PART- B 3 x 8 = 24 Marks**

**Instructions :**

**(i) Answer all questions**

**(ii) Each question carries EIGHT mark**

**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A) Describe about the tolerance levels in construction industry with examples . (CO3)

(OR)

(B) Explain various dimensional accuracies encountered in construction practice (CO3)

7. (A) Describe the safety measures to be taken while operating construction equipment . (CO4)

(OR)

(B) Explain the preventive methods for avoiding accidents in construction industry ? (CO4)

8. (A) Describe the role of loss control approach in the cost of accidents. (CO4)

(OR)

(B) Describe the general safety programme organised by construction industries. (CO4)

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**Model Paper for end examination :**

**MODEL PAPER – DIPLOMA EXAMINATION, (C-20)**

**DCE—FIFTH SEMESTER EXAMINATION**

**QUALITY CONTROL AND SAFETY IN CONSTRUCTION (C-505)**

**Time: 3 hours]** **[Total Marks: 80**

**PART—A** **3×10=30**

**Instructions** **(1) Answer all questions.**

**(2) Each question carries three marks.**

**(3) Answers should be brief and straight to the point and shall not exceed five simple sentences.**

1. List any three functional aspects of residential structures. (CO1)
2. State any three statutory regulations of advisory organisations. (CO1)
3. List any three preferred sizes of building components. (CO1)
4. State any three aspects of quality control in masonry works. (CO2)
5. Briefly explain the sampling plan of acceptance and rejection. (CO2)
6. Briefly explain the safety in use of any one of construction machinery. (CO3)
7. State any three classifications of construction accidents. (CO4)
8. State any three safety measures in construction of scaffolding. (CO4)
9. List any three cost controlling measures. (CO4)
10. State any three losses due to accidents. (CO4)

**PART – B** **5 x 8marks = 40marks**

**Answer either (a) or (b) from each questions from Part-B**

11. (A) Explain in detail the Production, quality control, batching and mixing of concrete. (CO2)

**(OR)**

(B)Explain in detail the tolerance levels and visual appearance in construction industry. (CO2)

12. (A) Describe in detail the accidents due to fall and its preventive measures. (CO3)

**(OR)**

(B) Describe in detail the demolition of buildings and the loading standards of a building. (CO3)

13. (A) Elaborate the general safety program for construction and accident report in construction. (CO4)

**(OR)**

(B) Elaborate the safety measures for hot bitumen works and erection of steel structures. (CO4)

14. A) Explain in detail the safety measures for excavation and storage &handling of building materials. (CO4)

**(OR)**

(B) Elaborate loss control approach in the cost of accidents and erectionof Prefabricated components. (CO4)

15. (A) Describe in detail the planning for accident prevention. (CO4)

**(OR)**

(B) Describe in detail the evaluation of risk and loss potential in the work. (CO4)

**PART – C**

**Question No.16 is compulsory and carries 10 marks**

16. Discuss the safety measures in using (i) Ladders (ii) Form work in constructions. (CO3)

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# CONSTRUCTION MANAGEMENT AND ENTREPRENEURSHIP

| Course code | Course title | No. Of period/week | Total no. Of periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-506 | Construction Management and Entrepreneurship | 03 | 45 | 20 | 80 |

| S. No | Major Topics | No. Of Periods | Cos Mapped |
|---|---|---|---|
| 1. | Introduction | 3 | CO1 |
| 2. | Organizational Aspects | 6 | CO1 |
| 3. | Management Tools | 8 | CO2 |
| 4. | Contracts and Tenders and Arbitration | 10 | CO3 |
| 5. | Management of Resources in Construction | 8 | CO4 |
| 6. | Entrepreneurship | 6 | CO5 |
| 7. | Human Relations and Professional Ethics | 4 | CO5 |
| | Total | 45 | |

**COURSE OBJECTIVES:**

| Upon completion of the course the student shall be able to | | |
|---|---|---|
| **Course Objectives** | (i) | Familiarize with the Preliminary Planning & Organizational aspects, constructional planning, contracts and tender systems. |
| | (ii) | Gainadequate knowledge in managing different resources in construction field and human relations and professional ethics. |

**COURSE OUTCOMES:**

| | | | |
|---|---|---|---|
| **Course Outcomes** | **CO 1** | C-506.1 | State the importance of project management and Organizational aspects. |
| | **CO 2** | C-506.2 | Analyse the tools of Management for construction projects in planning. |
| | **CO 3** | C-506.3 | Discussdifferent types of contracts,Tendering systems and Arbitration. |
| | **CO 4** | C-506.4 | Analyse the principles of management of Resources like Men, Material and Machinery. |
| | **CO 5** | C-506.5 | Discuss the role of Entrepreneur for better outcome in construction industrybyinculcating betterHuman Relations. |

LEARNING OUTCOMES:

| | |
|---|---|
| **Learning Outcomes** | **1.0 Introduction**<br>1.1. Define Management.<br>1.2. State the functions of Management.<br>1.3. State the need for scientific Management of projects.<br>1.4. Describe the fields level management.<br>1.5. Describe the sequencing of work<br>**2.0 Organizational Aspects**<br>2.1. Explain the organizational structure of any Engineering department (Government).<br>2.2. List the duties of different officers of an Engineering department.<br>2.3. Define Preliminary estimate, Detailed estimate, Administrative approval and Technical sanction.<br>2.4. State the limit of powers of sanction by various officers in an Engineering Department (Government).<br>2.5. Give the Organizational structure of a public sector construction company.<br>2.6. Compare the Headquarters versus Regional and Project Management.<br>2.7. List the duties of Chief Engineer in a construction company.<br>2.8. List the duties of a Resident Engineer.<br>**3.0 Management Tools**<br>3.1 Define CPM and PERT.<br>3.2 State the advantages of CPM and PERT.<br>3.3 Explain the use of bar chart and its limitations<br>3.4 Define Network, Activity, Event, Activity duration,Dummyactivity,EST, EFT, LST, LFT, Total float, free float and Critical path.<br>3.5 Prepare Network diagram using basic rules of network formation.<br>3.6 Calculate Project duration using CPM network identifying critical activities, critical path, free float and total float.<br>3.7 State the limitations of CPM.<br>3.8 Distinguish between CPM and PERT. |

| | |
|---|---|
| | **4.0 Contract, Tendering systems and Arbitration**<br>4.1 Define contract, State the contents of a contract document, and Explaindifferent contract systems available for construction works.<br>4.2 List the merits and limitations of each of the contract systems, List the general conditions of contract for a civil engineering construction project.<br>4.3 Define tender, Explain the need for calling of tenders, List the steps involved in fixing up agency through tender system.<br>4.4 Draft a tender notice for a work, Prepare tender documents.<br>4.5 Explain the need of earnest money and security deposits.<br>4.6 Prepare a comparative statement.<br>4.7 Explain the method of selecting a contractor from the tenders, List out the conditions of contract agreements.<br>4.8 Define the terms Dispute and Arbitration, Explain the scope for disputes in a construction industry.<br>4.9 State the need for arbitration, List the qualifications of an arbitrator, List the advantages of arbitration.<br>**5.0 Management of Resources in construction**<br>5.1 Explain the scope of materials management, Classify the common building materials based on the procurement, Explain different Stages of materials management.<br>5.2 Explain the points to be observed in the storage of perishable and non-perishable store materials, Explain the terms Indent, Invoice and Bin card, Explain the importance of verification of stores.<br>5.3 Explain the need for mechanization, Explain the need for optimum utilization of plant and equipment, Explain the financial impact of mechanization.<br>5.4 Explain about the preventive maintenance of plant and equipment.<br>5.5 Explain the importance of training of operators.<br>5.6 Explain the need for overhauling or replacement.<br>5.7 Explain the requirements of centering, shuttering and scaffolding<br>5.8 State the importance of finance as a resource.<br>5.9 Explain the different stages at which cost control can be achieved.<br>5.10 Explain the financial control at head office level and site level.<br>**6.0 Entrepreneurship**<br>6.1 Define 1. Entrepreneur and 2. Entrepreneurship.<br>6.2 Outline the concepts of entrepreneurship.<br>6.3 State the role of entrepreneur in economic development.<br>6.4 List the characteristics of an entrepreneur.<br>6.5 Evaluate the risks and rewards of an entrepreneur.<br>6.6 State the role of financial institutions in entrepreneurial development.<br>**7.0 Human relations and professional ethics**<br>7.1 State role of Human relations and Performance in organization.<br>7.2 State the role of Interpersonal relationship for effective work culture. |

**CO-PO Mapping:**

| Course Code : C-506 | Course Title: Construction Management and Entrepreneurship<br>Number of Cos: 05 | | | | No. Of Periods: 45 |
|---|---|---|---|---|---|
| **PO #** | **Mapped with CO #** | **CO Periods addressing PO in Column 1** | | **Level (1,2,3)** | **Remarks** |
| | | **No** | **%** | | |
| PO1 | CO1, CO2, CO3, CO4, CO5 | 18 | 40 | 3 | **> 40% Level 3 Highly addressed**<br>**25% to 40% Level 2 Moderately addressed**<br>**5 to 25% Level 1 Low addressed** |
| PO2 | CO2 | 3 | 7 | 1 | |
| PO3 | CO2 | 3 | 7 | 1 | |
| PO4 | CO2 | 3 | 7 | 1 | |
| PO5 | CO1, CO2, CO3, CO4, CO5 | 12 | 26 | 2 | |
| PO6 | CO1, CO2, CO3, CO4, CO5 | 6 | 13 | 1 | |
| PO7 | | | | | |

**PO-CO Mapping:**

| CO No. | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | | | | 2 | 2 | | 2 | 2 | 3 |
| CO2 | 2 | 3 | 2 | 1 | 2 | 3 | | 2 | 2 | 3 |
| CO3 | 2 | | | | 2 | 3 | | 2 | 2 | 3 |
| CO4 | 2 | | | | 1 | 2 | | 2 | 2 | 3 |
| CO5 | 2 | | | | 2 | 2 | | 2 | 2 | 3 |
| Average | 2.2 | 0.6 | 0.4 | 0.2 | 1.8 | 2.4 | | 2 | 2 | 3 |

**Note: The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**

**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc**

**COURSE CONTENT:**

**1. Introduction**

Definition and concept of management – need for scientific management of projects – need for attitudinal change – Scope and characteristics of construction Industry.

**2. Organizational Aspects**

Govt. Organizations: Organizational structure of P.W.D. – duties of various officers – Preliminary estimates – detailed estimate – budget provision – administrative approval and technical sanction – powers of sanction-Public sector organizations: Organizational structure of a construction company – Head quarters versus Regional and Project Management–Duties of Chief Engineer – preparation of bids – duties of Resident Engineer.

**3. Management Tools**

Different Management Tools – Gantt Bar chart, modified Gantt bar chart – Limitations of bar charts – Introduction CPM and PERT – advantages of CPM and PERT – terms used in CPM – formation of network – Basic rules – Problems on determination of critical path – limitations of CPM – comparison of CPM and PERT.

**4. Contracts, Tenders and Arbitration**

Contracts – Legality of contracts – contract document – types of contracts – piece work contracts – item rate contracts – Lump sum contracts – percentage contracts – negotiated rates – departmental execution of works – merits and limitations of each contract system – conditions of contract for civil engineering works-Tenders – Necessity of tenders – Sealed tenders – tender notice – tender documents – Earnest Money and Security Deposits – Opening of tenders – comparative statement – acceptance of tenders – work order – contract agreement – conditions of contract-Arbitration – Disputes – disputes in construction industry – arbitration – need for arbitration – arbitrator – qualifications of arbitrator – advantages of arbitration.

5. **Management of Resources in Construction Industry**

Materials management – Scope – Classification of common building materials based on the procurement – procedural formalities for acquisition – stages of materials management-
Plant and Equipment – Need for mechanization – Optimum utilization of plant and equipment – Financial impact of mechanization – Preventive maintenance –Overhauling and replacement – Cantering, shuttering and scaffolding requirements-Financial Management – Finance as Resource – Purpose of cost control – stages of cost control – pre contract stage and post contract stage – Financial control at head office level and site level.

**6. Entrepreneurship**

Entrepreneur – concept, definition, role, expectation – characteristics of entrepreneur – risk and rewards of an entrepreneur – role of financial institution in entrepreneurial development.

**7. Human Relations and Professional Ethics**

Human relations and performance in organization – Understand self and others for effective behaviour – Interpersonal relationship for effective work culture – Need for professional ethics.

**REFERENCE BOOKS**


1. Management in construction Industry ,P.Dharwadker,Oxford& IBH Publishing Co. Pvt., Ltd.
2. Construction Management And Accounts , V.N.Vazirani& S.P. Chandola, Khanna Publishers.
3. Construction Planning and Management ,U.K. Shrivastava,Galgotia Publications Pvt. Ltd., New Delhi.
4. Construction Management and Planning ,B. Sengupta & H. Guna , Tata Mc. Graw Hill Publishing Company Ltd .
5. Construction Management and Accounts ,Harpal Singh,Tata Mc. Graw Hill Publishing Company Ltd.

**MODEL BLUE PRINT**

| S. No | Major Topics | No. Of periods | Weightage of marks | Marks wise Distribution of Weightage | | | | Question wise Distribution of Weightage | | | | Cos Mapped |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | R | U | Ap | An | R | U | Ap | An | |
| 1 | Introduction | 3 | 03 | 03 | -- | -- | -- | 1 | - | - | -- | CO1 |
| 2 | Organizational Aspects | 6 | 11 | 03 | 08 | -- | -- | 1 | 1 | -- | -- | CO1 |
| 3 | Management Tools | 8 | 11 | 03 | 08 | -- | -- | 1 | 1 | -- | -- | CO2 |
| 4 | Contracts and Tenders and Arbitration | 10 | 14 | 03 | 11 | -- | -- | 1 | 2 | -- | -- | CO3 |
| 5 | Management of Resources in Construction | 8 | 14 | 03 | 11 | -- | -- | 1 | 2 | -- | -- | CO4 |
| 6 | Entrepreneurship | 6 | 06 | 06 | -- | -- | -- | 2 | -- | -- | -- | CO5 |
| 7 | Human Relations and Professional Ethics | 4 | 11 | 03 | 08 | -- | -- | 1 | 1 | -- | -- | CO5 |
| | **Higher order question from any or combination of 3,4,5,6 & 7 Chapters** | -- | 10 | -- | -- | -- | 10 | -- | -- | -- | 1 | CO2, CO3, CO4, & CO5 |
| | Total | 45 | 80 | 24 | 46 | -- | 10 | 8 | 7 | -- | 1 | |

**Table specifying the scope of syllabus to be covered for Unit Test-I & Unit Test-II**

| Unit Test | Learning Outcomes to be covered |
|---|---|
| Unit Test – I | From 1.1 to 4.4 |
| Unit Test – II | From 4.5 to 7.2 |

**Model Paper for Unit Test-I :**

**State Board of Technical Education and Training, A.P.**

**Diploma in Civil Engineering (DCE)**

**Fifth Semester :: C-506 Construction Management and Entrepreneurship**

**Time: 90 MinutesUnit Test –I** **Maximum Marks : 40**

**PART- A** **16 Marks**

**Instructions:**

(i) **Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1. (a) A construction manager will supervise &manage contractors and labourat construction sites. - True/False (CO1)

   (b) The difference between the time available to do a job and the time required to do a job is known as Bloat – True/False (CO2)

   (c) The sanction of the competent authority to a properly detailed estimate for a work to be done is known as ---------- (CO1)

   (d) The process whereby governments and financial institutions invite bids for large projects thatmust be submitted within finite deadlines (CO3)

2. State the need for scientific management of projects ? (CO1)

3. Define the terms CPM and PERT. (CO2)

4. What do you mean by (i) Activity (ii) Event (CO2)

5. State three contract systems? (CO3)

**PART- B** **3 x 8 = 24 Marks**

**Instructions:**

**(i) Answer all questions**

**(ii) Each question carries EIGHT mark**

**(ii) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A) Describe the duties of a Chief Engineer in Government Engineering Department (CO1)

   (OR)

   (B) Explain the organisation structure of a public sector construction company. (CO1)

7. (A) Describe the the process of preparation of a net work diagram using basic rules of network formation . (CO2)

   (OR)

(B) Draw the following CPM network diagram and find the critical path and its duration. (CO2)

| Activity | 1-2 | 1-3 | 2-5 | 3-4 | 3-5 | 4-5 |
|---|---|---|---|---|---|---|
| Duration in days | 4 | 3 | 3 | 1 | 3 | 5 |

8. (A) State the merits and limitations of different contract systems. (CO3)

(OR)

(B) State the general conditions of contract for civil engineering construction project (CO3)

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**Model Paper for Unit Test-II :**
**State Board of Technical Education and Training, A.P.**
**Diploma in Civil Engineering (DCE)**
**Fifth Semester :: C-506 Construction Management and Entrepreneurship**

Time: 90 Minutes **Unit Test –II** Maximum Marks : 40

**PART- A** **16 Marks**

**Instructions *:***

**(i)Answer all questions**

**(ii) First question carries FOUR marks, each question of remaining carries THREE marks.**

1. (a) EMD stands for Earliest Money deposit -- True/False (CO3)

   (b) Indent refers to the process of taking orders from stores – True/False (CO4)

   (c) The method of resolving disputes outside the courts is known as ---------- (CO3)

   (d) The process whereby governments and financial institutions invite bids for large projects that must be submitted within finite deadlines ... (CO3)

2. State the qualifications of a contractor that make him eligible for tender ? (CO3)
3. State the importance of verification of stores. (CO4)
4. List different stages of material management. (CO4)
5. State the characteristics of an entrepreneur. (CO5)

**PART- B** **3 x 8 = 24 Marks**

**Instructions :**

**(i) Answer all questions**

**(ii) Each question carries EIGHT mark**

**(iii) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.**

6. (A) List out the conditions of contract agreements. (CO3)

   (OR)

   (B) State the need for arbitration and list the advantages of arbitration. (CO3)

7. (A) Explain the preventive mainainance of plant and equipment . (CO4)

   (OR)

   (B) Explain different stages at which cost control can be achieved. (CO4)

8. (A) Explain the role of entrepreneur in economic development. (CO5)

   (OR)

   (B) Explain the role of human relations and performance in organisation. (CO5)

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**Model paper for End Examination:**

**MODEL PAPER – BOARD DIPLOMA EXAMINATION, (C–20)**

**DCE—FIFTH SEMESTER EXAMINATION**

**CONSTRUCTION MANAGEMENT AND ENTREPRENEURSHIP (C-506)**

**Time: 3 hours]** **[Total Marks: 80**

**PART—A** **3×10=30 Marks**

**Instructions: (1) Answer all questions.**

**(2) Each question carries three marks.**

**(3) Answers should be brief and straight to the point and shall not exceed five simple sentences.**

1. State any three functions of management (CO1)
2. hat is the need for technical sanction (CO1)
3. Define CPM and PERT (CO2)
4. Define the terms EMD and security deposit (CO3)
5. State the qualifications required for a contractor (CO3)
6. Define arbitrator and arbitration. (CO3)
7. State the need for mechanization. (CO4)
8. Define the terms Indent and Invoice (CO4)
9. State the role of DIC in promoting entrepreneurs. (CO5)
10. Explain briefly about human resource management. (CO5)

**PART – B** **8 x 5 marks = 40 marks**

**Answer either (a) or (b) from each questions from Part-B**

11. a) Draw a flow chart and explain organization of a construction company for an irrigation project. (CO1)

**(OR)**

b) List the duties of Chief Engineer in Roads and Buildings department. (CO1)

12. a) State any ten advantages of network analysis. (CO2)

**(OR)**

b) Explain the use of bar chart and its limitations (CO2)

13. a) “All contracts are agreements but all agreements are not contracts.” Explain. (CO3)

**(OR)**

b) Explain various steps involved in tender system. (CO3)

14. a) State the importance of form work (centering) and requirements of good form work. (CO4)

**(OR)**

b) Explain the requirements of centering, shuttering and scaffolding (CO4)

15. a) State role of Human relations and Performance in organization. (CO5)

**(OR)**

b) State the role of Interpersonal relationship for effective work culture. (CO5)

**PART – C**

**Question No.16 is compulsory and carries 10 marks**

16. The following project has eight activities and the expected time of each activity is given below: (CO2)

| Activity | 1-2 | 1-3 | 1-4 | 2-5 | 3-5 | 4-6 | 5-7 | 6-7 |
|---|---|---|---|---|---|---|---|---|
| Expected time (in days) | 1 | 2 | 4 | 5 | 3 | 6 | 5 | 2 |

a) Draw network diagram;

b) Identify the critical path.

c) Draw the table showing EST, LST, EFT and float.

***

**STRUCTURAL ENGINEERING DRAWING**

| Course code | Course title | No. Of period/week | Total no. Of periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-507 | Structural Engineering Drawing | 03 | 45 | 40 | 60 |

| S. No. | Major Topics | No. Of Periods | Cos Mapped |
|---|---|---|---|
| 1. | Structural Planning and marking of Frame components | 6 | CO1 |
| 2. | R.C.C. Drawings | 33 | CO2 |
| 3. | Reading and interpretation of Structural Drawings | 6 | CO3 |
| | **Total** | 45 | |

**COURSE OBJECTIVES:**

| Upon completion of the course the student shall be able to | | |
|---|---|---|
| **Course Objectives** | (i) | Prepare the working drawings for steel reinforcement in different RCC members and able to read and understand the given drawings. |
| | (ii) | Calculate Steel quantity required from the given drawings. |
| | (iii) | Gain knowledge on how to draw and read the different structural steel members. |

**COURSE OUTCOMES:**

| | | | |
|---|---|---|---|
| **Course Outcomes** | CO1 | C507.1 | Draw the individual RCC members and the placement of reinforcement in it. |
| | CO2 | C507.2 | Draw the working drawings and evaluate the bar bending schedule for the given drawings. |
| | CO3 | C507.3 | Read and understand the working drawings. |

**LEARNING OUTCOMES*:***

| | |
|---|---|
| **Learning Outcomes** | **1.0 structural planning and marking of Frame components**<br>1.1 Understand Positioning and Orientation of columns<br>1.2 Understand Positioning of beams<br>1.3 Understand Spanning of slabs<br>1.4 Explain layout of stairs<br>1.5 List types of footings<br>1.6 Prepare member reference scheme of Column reference scheme and Grid reference scheme (Scheme recommended by IS:5525 – recommended for detailing of reinforced concrete works and SP-34)<br><br>**2.0 Draw the detailed working drawings of R.C.C.**<br>2.1 Draw the longitudinal section and cross sections of singly reinforced simply supported beam, Prepare schedule of reinforcement and quantity of steel for singly reinforced simply supported beam<br>2.2 Draw the longitudinal and cross section of lintel cum sunshade, Prepare schedule of reinforcement and quantity of steel for lintel cum sunshade<br>2.3 Draw the plan and longitudinal section of one-way slab showing reinforcement details, Prepare schedule of reinforcement and quantity of steel for one-way slab showing reinforcement details<br>2.4 Draw the details of reinforcement of two-way simply supported slab with corners not held down condition, Draw top and bottom plan and section along short and long spans of two-way simply supported slab with corners not held down condition, Prepare schedule of reinforcement of two-way simply supported slab with corners not held down condition<br>2.5 Draw the details of reinforcement of two-way simply supported slab with corners held down conditions, Draw top and bottom plan and section along short and long spans have to be drawn. (Scheduling of reinforcement is not necessary).<br>2.6 Draw the details of reinforcement of one-way continuous slab along with T- beam with details of slab and T-beam (plan and section of continuous slab and longitudinal section of T-beam have to be drawn). (Scheduling of steel is not necessary)<br>2.7 Draw the details of column and square footing (plan and sectional elevation) prepare schedule of reinforcement of column and footing and quantity of steel required.<br>2.8 Draw the reinforcement details of dog legged stair case (section only) prepare schedule of reinforcement for one flight including landing.<br><br>**3.0 Read and interpret the drawings**<br>3.1 Understand the details of reinforcement from the given drawings<br>3.2 Fill in the details of reinforcement in a drawing. |

**PO-CO Mapping:**

| Course Code: C-507 | Course Title: Structural Engineering Drawing No.of Cos : 3 | | | | No. Of periods: 45 |
|---|---|---|---|---|---|
| Pos | Mapped with CO No | CO Periods Addressing PO in Col 1 | | Level (1,2,3) | Remarks |
| | | No | % | | >40% Level 3 (Highly Addressed) |
| PO1 | CO1,CO2,CO3 | 9 | 20 | 1 | 25% to 40% Level 2 (Moderately Addressed) |
| PO2 | CO1,CO2,CO3 | 23 | 50 | 3 | 5% to 25% Level 1 |
| PO3 | CO1,CO2,CO3 | 13 | 30 | 2 | ( Low Addressed) |
| PO4 | | | | | <5% Not Addressed |
| PO5 | | | | | |
| PO6 | | | | | |
| PO7 | | | | | |

**CO-PO Mapping:**

| CO No. | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | | | | | 1 | 2 | 2 |
| CO2 | 2 | 3 | 2 | | | | | 1 | 2 | 2 |
| CO3 | 2 | 3 | 3 | | | | | 1 | 2 | 2 |
| Average | 2.3 | 2.7 | 2.3 | | | | | 1 | 2 | 2 |

**Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**

**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc**

**COURSE CONTENT**

**1.0 Structural planning and marking of Frame components**

Draw the position of columns, beams, slabs, stairs and footing in a given line diagram of building – Prepare member reference scheme of Column reference scheme as per IS:696 code of practice for general engineering drawing and Grid reference scheme as per IS:5525 – recommended for detailing of reinforced concrete works and SP-34

**2.0 R.C.C Drawings**

Draw the longitudinal section and cross sections and Prepare schedule of reinforcement and quantity of steel for – Singly reinforced simply supported rectangular beam – Lintel cum sunshade –Simply supported one-way slab – Two-way slab simply supported corners not held down – Two-way slab simply supported corners held down – One-way continuous slab and T-beam (with details of slab and T-beam) – Column with square footing of uniform thickness.- Stair case – stairs spanning longitudinally (Dog legged stair case)

**3.0 Reading and interpretation of Structural Drawings**

Understand the details of reinforcement from the given drawings - Fill in the details of reinforcement in a drawing.

**REFERENCE BOOKS**

1. Designing and detailing hand book SP-34

**MODEL BLUE PRINT**

| S. No | Major Topics | No. Of periods | Weightage of marks | Marks wise Distribution of Weightage | | | | Question wise Distribution of Weightage | | | | CO's Mapped |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | R | U | Ap | An | R | U | Ap | An | |
| 1. | Structural Planning and marking of Frame components | 6 | 10 | -- | 10 | -- | -- | -- | 1 | -- | -- | CO1 |
| 2 | R.C.C. Drawings | 33 | 40 | -- | 40 | -- | -- | -- | 2 | -- | -- | CO2 |
| 3. | Reading and interpretation of Structural Drawings | 6 | 10 | -- | 10 | -- | -- | -- | 1 | -- | -- | CO3 |
| | Total | 45 | 60 | | 60 | | | | 4 | | | |

**Note**: In question paper Part-A consists of two questions of 10 marks each, one from Structural Planning and marking of Frame components and other from Reading and interpretation of Structural Drawings. Part-B consists of two questions of 20 marks each from R.C.C. Drawings.

**MODEL PAPER – BOARD DIPLOMA EXAMINATION, (C–20)**

**DCE—FIFTH SEMESTER EXAMINATION**

**STRUCTURAL ENGINEERING DRAWING- II (C-507)**

**Time: 3 hours]** **[Total Marks:60**

**PART—A** **2×10=20 Marks**

**Instructions: (1) Answer all questions.**

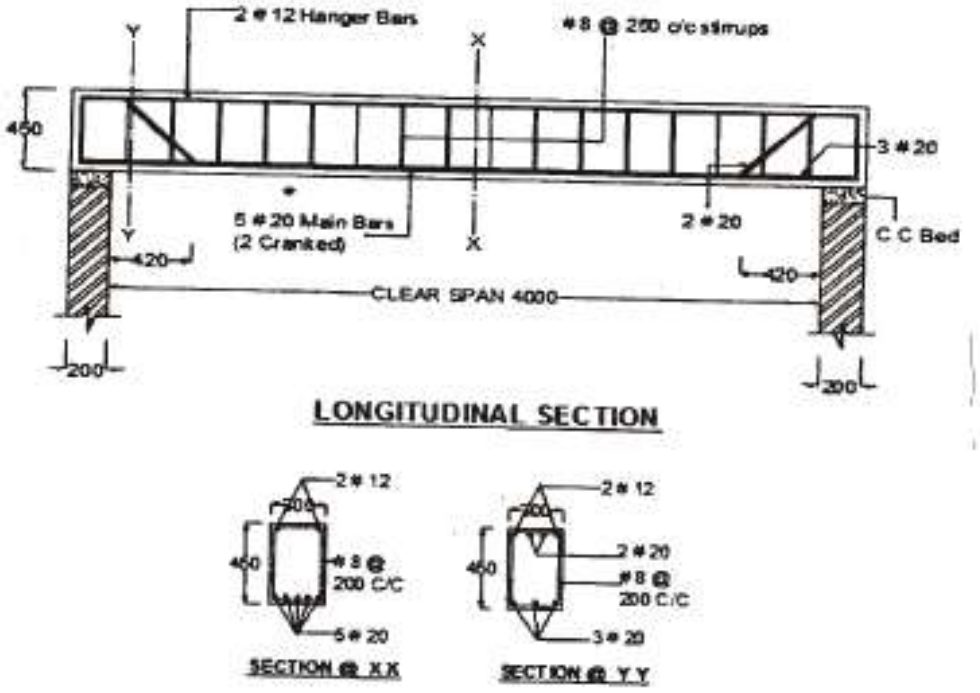
**(2) Each question carries ten marks.**

**(3) All parts must be drawn to scale.**

**(4) Any missing data may be assumed suitably.**

1. Redraw the fig. Given below and name the columns and beams as per the 'column reference scheme 'and 'grid reference scheme'.

2. Prepare the bar bending schedule and find the quantity of steel required for the simply supported beam shown in the figure below. Top and bottom covers are 25 mm and side cover is 40 mm.



**PART-B** **2×20=40 Marks**

**Instructions: (1) Answer all questions.**

**(2) Each question carries twenty marks.**

**(3) All parts must be drawn to scale.**

**(4) Any missing data may be assumed suitably.**

3. An RCC lintel with sunshade has the following specifications :

| | | |
|---|---|---|
| Clear span of lintel | : | 1500 mm |
| Width of wall | : | 230 mm |
| Size of lintel | : | 230 mm × 200 mm |
| Bearing on walls | : | 150 mm |
| Projection of sunshadefrom face of the wall | : | 600 mm |
| Thickness of sunshade | : | 100 mm to 50 mm |
| Reinforcement of Lintel : | | |
| Main reinforcement | : | 3 nos. Of 12 mm dia (all straight bars) |
| Hanger bars | : | 2 nos. Of 10 mm dia |
| Stirrups | : | 6 mm dia. 2-legged at 150 mm c/c |
| Reinforcement of Sunshade : | | |
| Main bars | : | 10 mm dia bars at 140 mm c/c |

Distribution steel : 6 mm dia @ 120 mm c/c
Draw to a scale of 1 : 10 :
(a) Longitudinal section of lintel 10+10
(b) Cross-section of lintel with sunshade 10Width of canal bund = 900 mm

4. Draw the reinforcement details of a simply supported RCC two way slab whose corners are free to lift, with the following specifications :

Size of the room—4·0 m × 5·0 m
Edge conditions—simply supported, corners not held down
Overall depth of slab—140 mm
Bearing on walls—230 mm
Materials:
Concrete—M-20 grade , Steel—Fe 415
Reinforcement:
Along shorter span—# 12 at 200 mm c/c
(alternate bars are cranked at a distance of 400 mm from the face of the support)
Along longer span—# 10 at 250 mm c/c
(alternate bars are cranked at a distance of 500 mm from the face of the support)

Provide 3#8 hanger bars at each edge to keep top bars in position.
Covers:
Bottom clear cover 12 mm
Top clear cover 12 mm
End covers 20 mm

(i) Bottom plan of the reinforcement 10+5+5
(ii) Top plan of the reinforcement
(iii)Cross-section along the shorter span

**Life Skills**

| Course Code | Course Title | No. Of Periods/Week | Total No. Of Periods | Marks for FA | Marks for SA |
|---|---|---|---|---|---|
| C-508 | Life Skills | 3 | 45 | 40 | 60 |

| S. No. | Unit Title | No of Periods | Cos Mapped |
|---|---|---|---|
| 1 | **Attitude** | **4** | CO1 |
| 2 | **Adaptability** | **4** | CO1, CO2 |
| 3 | **Goal Setting** | **4** | CO1, CO2, CO3 |
| 4 | **Motivation** | **4** | CO1, CO2, CO3 |
| 5 | **Time Management** | **4** | CO2 |
| 6 | **Critical thinking** | **4** | CO3 |
| 7 | **Creativity** | **4** | CO3 |
| 8 | **Problem Solving** | **5** | CO3 |
| 9 | **Team Work** | **4** | CO4 |
| 10 | **Leadership** | **4** | CO4 |
| 11 | **Stress Management** | **4** | CO4 |
| **Total Periods** | | **45** | |

| | |
|---|---|
| **Course Objectives** | To understand the importance of Life skills for acceptable, sustainable and ethical behaviour in academic, professional and social settings |
| | To exhibit language competence appropriate to acceptable social and professional behaviour. |
| | To demonstrate time management, stress management, team skills, problem solving ability to manage oneself in academic, professional and social settings. |

| CO No. | Course Outcomes |
|---|---|
| CO1 | Demonstrates positive attitude and be able to adapt to people and events |
| CO2 | Fixes personal and professional goals and manages time to meet targets |
| CO3 | Exhibits critical and lateral thinking skills for problem solving. |
| CO4 | Shows aptitude for working in teams in a stress free manner and sometimes/ very often/ mostly display leadership traits. |

**CO-PO Matrix**

| **Course Code**<br><br>**C-508** | **Course Title: English**<br><br>**Number of Course Outcomes: 4** | | | | **No. Of Periods: 45** |
|---|---|---|---|---|---|
| Pos | Mapped with CO No. | CO Periods Addressing PO in Column 1 | | Level of Mapping<br><br>(1,2,3) | Remarks |
| | | Number | Percentage % | | |
| PO1 | | Not directly applicable for Life Skills Course. However activities that use content and situations from academic, professional and social settings relevant to the Programme shall be exploited for triggering thought and interaction in the Course. | | | |
| PO2 | | | | | |
| PO3 | | | | | |
| PO4 | | | | | |
| PO5 | CO1, CO2, CO3, CO 4 | 11 | 25% | | >60%: Level 3 |
| PO6 | CO1, CO2, CO3, CO4 | 27 | 45% | | 16 -59%: Level 2 |
| PO7 | CO1, CO2, CO3, CO4 | 7 | 30% | | Up to 15%: Level 1 |

Level 3 – Strongly Mapped
Level 2- Moderately Mapped
Level 1- Slightly Mapped

**Mapping Course Outcomes with Program Outcomes:**

| CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 |
|---|---|---|---|---|---|---|---|
| CO 1 | | | | | ✓ | ✓ | ✓ |
| CO 2 | | | | | ✓ | ✓ | ✓ |
| CO3 | | | | | ✓ | ✓ | ✓ |
| CO4 | | | | | ✓ | ✓ | ✓ |

**Blue Print for evaluation based on Course Outcomes for SA:**

Note: Every Activity based Question that focuses on Cos and responses as exhibited through communication has to be given marks for the following parameters

- Clarity of Thinking as Exhibited through Content
- Features of Etiquette

***Rubric Descriptors 'Outstanding/ Very Good/ Good/ Satisfactory/ Poor' levels of Competence**

| Level of Competence | Parameters of Assessment | |
|---|---|---|
| | **Clarity of thinking as exhibited through content** | **Features of etiquette** |
| **Outstanding 10** | **Thinking** is **extremely logical** and suggested course of action is **feasibile**<br>Shows **creativity and uniqueness**<br>Exhibits **expert use of expression** (organizational devices and discourse markers) that denote clarity in thought. | Exhibits **courtesy to all most appropriately**with**confidence** |
| **Very Good 8/9** | **Thinking** is **clear and logical**<br>Suggested **course of action is feasible**<br>Shows **traces of creativity**<br>Exhibits **good expression** (organizational devices and discourse markers) that denote clarity in thought. | Exhibits **courtesy to all to a considerable level.** |

| | | |
|---|---|---|
| **Good 6/7** | **Thinking is clear and logical most of the time**. Lacks creativity or out of the box thinking as expressed through content. | Exhibits **courtesy / politeness to an acceptable level.** |
| **Satisfactory 4/5** | **Thinking is logical**; However **expressing content is disjointed and disorganized.** | Has courtesy but often fumbles with language. |
| **Poor 3 or less than 3** | **Thoughts** as expressed through content are **incoherent. Language skills are very limited.** | Fails to show courtesy to others. |

**Blue Print for evaluation based on Course Outcomes for SA of each student:**
**Note: Marks are awarded for each student as per the Rubric descriptors.**

| S No. | Questions based on Course Outcomes | Periods Allocated for practical work | Max Marks | Poor >3 | Satisfactory 4 /5 | Good 6/7 | Very Good 8/9 | Outstanding 10 |
|---|---|---|---|---|---|---|---|---|
| 1 | Short presentation on GOALS with Timeline and Action Plan | 12 | 10 | | | | | |
| 2 | State what you will do in the given situation (Assesses adaptability and critical thinking skills, leadership, team skills ) | 12 | 10 | | | | | |
| 3 | In how many different and creative way can you use _____ (Object) other than its primary use | 8 | 10 | | | | | |
| 4 | What solutions can you think of for _____ problem. | 13 | 10 | | | | | |
| | **Total** | **45** | **60** | | | | | |

**Note: The marks that are awarded for the student for 40 to be increased proportionally for 60.**

**Learning Outcomes**

**1. Attitude Matters :**

1.1 Understand the importance of positive attitude and the consequences of negative attitude.

1.2 Demonstrate positive attitude in dealing with work-related issues and in personal life.

**2. Adaptability….makes life easy :**

2.1 Understand the significance of adaptability.

2.2 Show adaptability whenever needed, both at place of work and on personal front.

**3. Goal Setting … life without a Goal is a rudderless boat!**

3.2 Understand the SMART features of goal-setting.

**3.3** State one's short-term and long-term goals and spell out plans to achieve them.

**4. Motivation … triggers success!**

4.2 Comprehend the need for motivation in order to achieve success in life.

4.3 State how one is motivated in life.

4.4 Show the impact of motivation on one's life

**5. Time Management… the need of the Hour!**

5.2 Understand the value of time management and prioritizing in life

5.3 Demonstrate the effect of time management on one's professional work.

**6. Critical Thinking … logic is the key!**

6.1 Distinguish between facts and assumptions

6.2 Use logical thinking in dealing with professional matters

**7. Creativity … the essential you!**

7.2 Understand the importance of thinking out of the box in dealing with critical issues

7.3 Solve problems using creativity / imagination

**8. Problem Solving … there is always a way out!**

8.2 Understand the need for and importance of problem solving.

8.3 Use logic or creativity to solve a problem at workplace or home.

**9. Team Work… together we are better!**

9.1 Understand the need for team skills / team building

9.2 Demonstrate one's skills as a team player

**10. Leadership… the meaning of a leading!**

10.1 Understand the need for team skills / team building

10.2 Demonstrate one's skills as a team player

**11. Stress Management… live life to the full!**

11.1 Understand what causes stress and how to cope with stress at workplace.

11.2 Demonstrate how stress can be overcome in a healthy way.

# FIELD PRACTICES

| Course code | Course title | No. Of period/week | Total no. Of periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-509 | Field Practices | 07 | 105 | 40 | 60 |

| S.No. | Chapter/Unit title Name | No. Of periods/week | CO's Mapped |
|---|---|---|---|
| 1. | Marking for the earth work of a pillar &for the junction of two walls | 07 | CO1 |
| 2. | Marking the centre line of a one roomed building | 07 | CO1 |
| 3. | Marking for the earth work of a simple two roomed building | 07 | CO2 |
| 4. | Marking for the centre line of a one room in a residential building with reference to the given point using Total Station | 07 | CO2 |
| 5. | Preparation of cement mortar with specified mix proportion by manual mixing and volumetric proportioning. | 07 | CO3 |
| 6. | Construction of 230mm thick brick wall in English Bond at the corner of a Wall and check for horizontality and verticality. | 10 | CO3 |
| 7. | Supervisory skills of Plastering of a wall. | 10 | CO4 |
| 8. | Supervisory skills for construction of Cement Concrete Flooring and of fixing of floor trap, gully trap and their connections to drain. | 10 | CO4 |
| 9. | Placement of reinforcement in an Isolated Column Footing with proper cover & Positioning of shuttering to the column reinforcement | 10 | CO5 |
| 10. | Placement of reinforcement for sun shade (with specific attention of location). | 10 | CO5 |

| | | | |
|---|---|---|---|
| | | | |
| 11. | Placement of reinforcement for stairs spanning longitudinal case (with specific attention at the junction of waist and landing slabs). | 10 | CO5 |
| 12. | Placement of reinforcement for slab (with specific attention of chairs). OR<br><br>Placement of reinforcement for a Beam column junction (with specific attention to Earth quake resistance design). | 10 | CO5 |
| | Total Periods | 105 | |

**COURSE OBJECTIVES*:***

| Upon completion of the syllabus, the student shall be able to | | |
|---|---|---|
| **COURSE OBJECTIVES** | (i) | Learn the marking for earthwork, footings, basement and walls/columns of simple buildings. |
| | (ii) | Familiarise with the process of plastering, concreting and fixing of traps |
| | (iii) | Gain knowledge on the placement of reinforcement for different components of a building. |

**COURSE OUTCOMES:**

| | | | |
|---|---|---|---|
| **COURSE OUTCOMES** | CO 1 | C-509.1 | Mark for earthwork of pillars, junction of two walls, simple buildings. |
| | CO 2 | C-509.2 | Mark centre line for simple buildings. |
| | CO 3 | C-509.3 | Prepare cement mortar mix by volumetric batching, arrange bricks in different bonds to plumb. |
| | CO 4 | C-509.4 | Supervise plastering of walls, C.C.Flooring and fixing of traps. |
| | CO 5 | C-509.5 | Position shuttering and reinforcement in various components of building. |

**LEARNING OUTCOMES:**

| | |
|---|---|
| **LEARNING OUTCOMES** | **1.0 Marking for the earth work of a pillar & for the earth work of a junction of two walls**<br>1.1 Note down the measurements of pillar at superstructure and measurements of earth work excavation.<br>1.2 Mark the centre lines of pillar in either direction.<br>1.3 Mark the size of pillar with reference to the centre lines.<br>1.4 Mark the size by pouring the lime.<br>1.5 Read the width of walls at super structure from drawing.<br>1.6 Mark the centre line of main walls from the markings on marking pedestals.<br>1.7 Mark the centre line of cross wall perpendicular to main wall with the help of wooden set square or by other means.<br>1.8 Transfer the same by pouring the lime on the centre line.<br><br>**2.0 Marking the centre line of a one roomed building**<br>2.1 Read the width of walls at super structure and width of earth work excavation from drawing.<br>2.2 Mark the centre line of main wall from the markings on marking pedestals.<br>2.3 Mark the centre line of cross wall perpendicular to main wall with the help of wooden set square or by other means.<br>2.4 Mark the width of walls with reference to centre lines of walls.<br>2.5 Transfer the same by pouring the lime to proceed for excavation.<br>2.6 Mark the width of excavation with the help of threads placed parallel to the centre line and at a distance equal to half the width of excavation on either side of centre line.<br>2.7 Transfer the same by pouring lime to proceed for excavation.<br><br>**3.0 Marking for the earth work of a simple two roomed building**<br>3.1 Prepare the centre line diagram from a given drawing.<br>3.2 Note down width of earthwork excavation.<br>3.3 Mark the centre lines on the ground with the help of plumb bob.<br>3.4 Check the accuracy by measuring length of two diagonals and their equality.<br>3.5 Mark the width of excavation with the help of threads placed parallel to the centre line and at a distance equal to half the width of excavation on either side of centre line.<br>3.6 Transfer the same by pouring lime to proceed for excavation.<br><br>**4.0 Marking for the centre line of a one room in a residential building with reference to the given point using Total Station**<br>4.1 Place the total station at the point of known co-ordinates.<br>4.2 Perform temporary adjustments.<br>4.3 Key in the known co-ordinates of the point.<br>4.4 Place the target prism on the ground to locate the first corner point of known/calculated co-ordinate of centre line of the room. |

| | |
|---|---|
| | 4.5 Transfer the first corner point on to the ground.<br>4.6 Repeat the procedure to locate the second, third, fourth corner points of known co-ordinates and transfer the points on to the ground.<br><br>**5.0 Preparation of cement mortar with specified mix proportion by manual mixing and volumetric proportioning**<br>5.1 Note the mix proportion and take the respective quantities of cement and sand (volume of 1bag of cement = 0.035 cubic meter).<br>5.2 Place the measured quantity of sand to a suitable stack on an impervious hard surface.<br>5.3 Spread the cement uniformly over the sand stack.<br>5.4 Dry mix both sand and cement thoroughly to a uniform colour.<br>5.5 Sprinkle sufficient quantity of water on the dry mix while thoroughly mixing the dry mortar, which can be used for 30 minutes.<br>5.6 Continue the mixing to bring the mortar to a stiff paste of working consistency.<br><br>**6.0 Construction of 230mm thick brick wall in English Bond at the corner of a wall and check for horizontality and verticality**<br>6.1 Soak the bricks in water and air dry before their use.<br>6.2 Prepare C.M of specified proportion and keep ready for use<br>6.3 Sketch the two threads perpendicular to each other at specified corner in line with the outer edges of wall.<br>6.4 Arrange the quoin header in line with the two perpendicular threads<br>6.5 Arrange the queen closure adjacent to quoin header.<br>6.6 Continue one layer with headers on one face and stretchers on the perpendicular face to the true line.<br>6.7 Continue the next layer with stretchers on headers and headers on stretchers.<br>6.8 Check the verticality of the wall with the help of plumb bob and horizontality with the help of level tube for every three to four layers.<br>6.9 Place the bricks, with frog at the top.<br>6.10 Fill the vertical joint in each layer with mortar using trowel.<br><br>**7.0 Supervisory skills of Plastering of a wall**<br>7.1 Prepare the surface by raking the joints and brushing the efflorescence if any by brushing and scraping dust and loose mortar.<br>7.2 Remove efflorescence if any by brushing and scraping.<br>7.3 Wash the surface thoroughly with water and keep the surface wet before commencement of plastering.<br>7.4 Complete the ceiling plaster before commencement of wall plaster<br>7.5 Fill all put log holes in advance of the plastering. |

| | |
|---|---|
| | 7.6 Start plastering from top and work down towards the floor.<br>7.7 Apply 15cm x 15cm plaster of specified thickness first, horizontally and vertically at not more than 2.0m intervals over the entire surface to serve as gauges.<br>7.8 Check the surfaces of gauges for truly in plane of the finished plaster surface by using a plumb bob.<br>7.9 Apply the mortar on the wall between the gauges with a trowel to a thickness slightly more than the specific thickness.<br>7.10 Use a wooden straight edge to bring to the true surface with small upward and sideways movement at a time reaching across the gauges.<br>7.11 Use trowel to obtain final finish surface as a smooth OR wooden float for sandy granular texture.<br>7.12 Avoid excessive use of trowel or over working the float.<br><br>**8.0 Supervisory skills for construction of Cement Concrete Flooring and for fixing of floor trap, gully trap and their connections to drain.**<br><br>**a. Base Concrete**<br>8.1 Use cement concrete of specified mix<br>8.2 Provide base concrete with the slopes towards floor trap required for the flooring using tube level.<br>8.3 Provide a slope ranging from 1:48 to 1:60 for flooring in varandah, courtyard, kitchen and bath.<br>8.4 Provide a slope of 1:30 for floors in water closet portion.<br>8.5 Provide necessary drop of 6mm to 10mm in flooring in bath, water closet and kitchen near floor traps to avoid spread of water.<br><br>**b. Finishing**<br>8.6 Follow the finishing of the surface immediately after the cessation of beating.<br>8.7 Allow the surface till moisture disappears from it.<br>8.8 Use of dry cement or cement mortar to absorb excessive moisture not permitted.<br>8.9 Spread the thick slurry of fresh cement and water @ 2kg of cement over an area of 1 square metre of flooring, while flooring concrete is still green.<br>8.10 The cement slurry shall be properly processed and finished smooth.<br>8.11 Finish the edge of sunk floor rounded with C.M 1:2 and finish with a floating coat of neat cement.<br>8.12 Cure the surface for a minimum period of 10 days.<br>8.13 Lay the flooring in lavatories and bath rooms only after fixing of water closets and squatting pans and floor traps.<br>8.14 Plug the traps while laying and open after curing and cleaning. |

**c. Fixing of traps and their connections to drain.**

8.15 Identify the Floor trap and Gully trap
8.16 Identify the location of fixing the floor trap and gully trap
8.17 Connect the floor trap to the drain pipe.
8.18 Fix the joint using proper filler and adhesive material such that the joint is water tight.
8.19 Fix gully trap on cement concrete foundation 65 mm x 65 mm and not less than 10 mm thick.
8.20 Prepare a mix of concrete 1:5:10 and jointing of gully outlet to the branch drain is done
8.21 Tarred gasket soaked in thick cement slurry shall first be placed round the spigot of the drain
8.22 The remainder of the socket is filled with stiff mixture of cement mortar in the proportion of 1:1.

**9.0 Placement of reinforcement for an Isolated Column Footing and positioning of shuttering to the column reinforcement.**

9.1 The grill of column footing should be kept ready as per design data.
9.2 Mark the centre lines in both directions on levelling course / bedding concrete with the help of plumb bob from the string stretched over the marking pedestals.
9.3 Mark centre of the outer reinforcing rods of footing in either direction.
9.4 Carefully place the grill such that centre line markings of outermost reinforcing rods are exactly above the centre lines marked on the bedding concrete.
9.5 Place the chairs/cover blocks of specified thickness below the bottom layer of reinforcing rods.
9.6 Exercise care for rectangular column footing while placing reinforcing mat such that bars in longer direction are at bottom.
9.7 Place the column reinforcement with chairs or cover blocks over the foundation mat.
9.8 Prepare the reinforcement as per the drawing.
9.9 Check for the verticality of column reinforcement with plumb bob
9.10 Provide lateral support for the column reinforcement to keep them in position.
9.11 Prepare the shuttering and apply waste oil inside surface of the shuttering box and fastenings
9.12 Place the shuttering box around the column and fix the fastenings.
9.13 Check for the verticality of shuttering with plumb bob

| | |
|---|---|
| | **10.0 Placement of reinforcement for sun shade (with specific attention of location)**<br>10.1 Prepare the reinforcement as per design<br>10.2 Prepare the centering for sun shade<br>10.3 Place the grill for sun shade such that the main reinforcement is in the top zone leaving the cover<br>10.4 Place the cement mortar cover blocks or chairs of specified height below the main reinforcement to have prescribed cover above the reinforcement<br>10.5 Observe for sufficient length of anchorage of main reinforcement into the lintel or the beam etc.<br><br>**11.0 Placement of reinforcement for stairs spanning longitudinal case (with specific attention at the junction of waist and landing slabs)**<br>11.1 Read the reinforcement details from the bar bending schedule<br>11.2 Prepare the shuttering for the stairs as per the design.<br>11.3 Bend the reinforcing bars to the shape and length confirming to the bar bending schedule.<br>11.4 Place the bars at the specified spacing maintaining the cover with the help of chairs or cover blocks.<br>11.5 Exercise care in the placement of reinforcement at the junction of waist and loading slab.<br>11.6 Tie the distributors parallel to raisers at the specified spacing<br>**12.0 Placement of reinforcement for slab (with specific attention of chairs) and placement of reinforcement for a beam column junction (with specific attention to Earth Quake resistance design)**<br>12.1 Prepare the reinforcement as per design<br>12.2 Rest the reinforcement in slabs on bar chairs<br>12.3 Securely fix the bar to chairs so that it won't move when concrete is placed around it.<br>12.4 Locate reinforcing bars and mesh so that there is enough room between the bars to place and compact the concrete.<br>12.5 Anchor the reinforcement to improve the transfer of tensile forces to the steel by bending or hooking or lapping the bars.<br>12.6 Read the reinforcement details from the bar bending schedule<br>12.7 Note down proper cover-clear cover, nominal cover or effective cover to reinforcement.<br>12.8 Decide detailed location of opening/hole and supply adequate details for reinforcements around the openings..<br>12.9 Show enlarged details at corners, intersection of beams and column junction<br>12.10 Avoid congestion of bars at points where members intersect and make certain that all reinforcement is properly placed.<br>12.11 In the case of bundled bars, Make lapped splice of bundled bars by splicing one bar at a time<br>12.12 Stagger such individual splices within the bundle. Make sure that hooked and bent up bars can be placed and have adequate concrete protection. |

**PO-CO MAPPING STRENGTH:**

| Course Code : C-509 | Course Title: Field Practices<br>Number of Cos: 05 | | | | No. Of Periods: 105 |
|---|---|---|---|---|---|
| Pos | Mapped with CO Nos. | CO periods addressing PO in Col.1 | | Level (1,2,3) | Remarks |
| | | No. | % | | |
| 1 | CO1,CO2.CO3,C04,C05 | 15 | 14 | 1 | >40% Level.3 (Highly addressed) |
| 2 | CO1,CO2.CO3,C04,C05 | 32 | 30 | 2 | |
| 3 | CO1,CO2.CO3,C04,C05 | 32 | 30 | 2 | 25% - 40% Level.2 (Moderately addressed |
| 4 | CO1,CO2.CO3,C04,C05 | 21 | 20 | 1 | |
| 5 | | | | | 5% - 25% Level.1 (Low addressed) |
| 6 | | | | | |
| 7 | CO1,CO2.CO3,C04,C05 | 5 | 6 | 1 | <5% Not addressed |

**CO-PO MAPPING:**

| CO No. | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 2 | 2 | 3 | | | 2 | 2 | 3 |
| CO2 | 2 | 3 | 2 | 3 | 3 | | | 2 | 2 | 3 |
| CO3 | 3 | 2 | 3 | 3 | 2 | | | 2 | 2 | 3 |
| CO4 | 2 | 2 | 2 | 2 | 2 | | | 2 | 2 | 3 |
| CO5 | 2 | 2 | 2 | 2 | 2 | | | 2 | 2 | 3 |
| Average | 2.2 | 2.4 | 2.2 | 2.4 | 2.4 | | | 2 | 2 | 3 |

**Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**

**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz**

**(vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc**

**Key competencies to be achieved by the student**

| S.No | Experiment title | Key competency |
|---|---|---|
| **1** | Marking for the earth work of a pillar.<br>Marking for the earth work for the junction of two walls | Mark the size of pillar with reference to the centre lines.<br>Mark the centre line of main walls from the markings on marking pedastals |
| **2** | Marking the centre line of a one roomed building | Mark the centre line of cross wall perpendicular to main wall |
| **3** | Marking for the earth work of a simple two roomed building | Check the accuracy by measuring length of two diagonals and their equality. |
| **4** | Marking for the centre line of a one room in a residential building with reference to the given point using Total Station | Transfer the first corner point on to the ground. |
| **5** | Preparation of cement mortar with specified mix proportion by manual mixing and volumetric proportioning. | Dry mix both sand and cement thoroughly to a uniform colour |
| **6** | Construction of 230mm thick brick wall in English Bond at the corner of a Wall and check for horizontality and verticality. | Arrange the quoin header in line with the two perpendicular threads |
| **7** | Supervisory skills of Plastering of a wall. | Complete the ceiling plaster before commencement of wall plaster |
| **8** | Supervisory skills for construction of Cement Concrete Flooring. Supervisory skills of fixing of floor trap, gully trap and their connections to drain. | The cement slurry shall be properly processed and finished smooth. Fix the joint using proper filler and adhesive material such that the joint is water tight. |
| **9** | Placement of reinforcement in an Isolated Column Footing with proper cover.<br>Positioning of shuttering to the column reinforcement | Mark centre of the outer reinforcing rods of footing in either direction. Place the shuttering box around the column and fix the fastenings |
| **10** | Placement of reinforcement for sun shade (with specific attention of location) | Place the grill for sun shade such that the main reinforcement is in<br>the top zone leaving the cover |
| **11** | Placement of reinforcement for stairs spanning longitudinal case (with specific attention at the junction of waist and landing slabs). | Exercise care in the placement of reinforcement of at the junction of waist and loading slab. |
| **12** | Placement of reinforcement for slab (with specific attention of chairs).<br>Placement of reinforcement for a Beam column junction (with specific attention to Earth quake resistance design). | Locate reinforcing bars and mesh so that there is enough room between the bars to place and compact the concrete.<br>Decide detailed location of opening/hole and supply adequate details for reinforcements around the openings.. |

**COURSE CONTENT**

1. Marking for the earth work of a pillar. Marking for the earth work for the junction of two walls.
2. Marking the centre line of a one roomed building
3. Marking for the earth work of a simple two roomed building.
4. Marking for the centre line of a one room in a residential building with reference to the given point using Total Station.
5. Preparation of cement mortar with specified mix proportion by manual mixing and volumetric proportioning.
6. Construction of 230mm thick brick wall in English Bond at the corner of a Wall and check for horizontality and verticality.
7. Supervisory skills of Plastering of a wall.
8. Supervisory skills for construction of Cement Concrete Flooring. Supervisory skills of fixing of floor trap, gully trap and their connections to drain.
9. Placement of reinforcement in an Isolated Column Footing with proper cover. Positioning of shuttering to the column reinforcement.
10. Placement of reinforcement for sun shade (with specific attention of location).
11. Placement of reinforcement for stairs spanning longitudinal case (with specific attention at the junction of waist and landing slabs).
12. Placement of reinforcement for slab (with specific attention of chairs). Placement of reinforcement for a Beam column junction (with specific attention to Earth quake resistance design).

**REFERENCE:**


1. CPWD SPECIFIATIONS , Govt of India Vol I&II, 2009
2. Practical Civil engineering hand book, Kale and Shaw
3. Building Construction, S.P.Bindra&S.P.Arora, Dhanpat Rai publications
4. National Building Code, BIS publication

## CAD PRACTICE – II

| Course code | Course title | No. of period/week | Total no. of periods | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|---|
| C-510 | CAD PRACTICE-II | 06 | 90 | 40 | 60 |

| S. No. | Major Topics | No. of Periods | COs Mapped |
|---|---|---|---|
| 1. | Culverts and Bridge Drawings | 18 | CO1 |
| 2. | Public Health Engineering Drawings | 18 | CO2 |
| 3. | Irrigation Engineering Drawings | 21 | CO3 |
| 4. | Structural Engineering Drawings | 21 | CO4 |
| 5. | MS Excel applications in Building Estimates | 12 | CO5 |
| | Total | 90 | |

**COURSE OBJECTIVES:**

| Upon completion of the Course, the student shall be able to | |
|---|---|
| **Course Objectives** | 1. Gain the skills in drawing of different Engineering Structures using CAD software |
| | 2. Prepare the estimates for quantities of building components using MS Excel. |

**COURSE OUTCOMES:**

| | | | |
|---|---|---|---|
| **Course Outcomes** | CO 1 | C-510.1 | Draw different views of culverts and bridges. |
| | CO 2 | C-510.2 | Draw the Components of Public health Engineering Structures |
| | CO 3 | C-510.3 | Draw the different views of Irrigation Engineering Structures |
| | CO 4 | C-510.4 | Practice different Structural Engineering Drawings |
| | CO 5 | C-510.5 | Estimate the different quantities of building components using MS Excel. |

**LEARNING OUTCOMES:**

| | |
|---|---|
| **Learning Outcomes** | **1.0 Culverts and Bridge Drawings**<br>1.1 Draws the plan, cross sectional elevation and longitudinal sectional elevation of pipe culverts, R.C.C.- slab culvert and identifies the component parts from the given set of specifications.<br>1.2 Draws the sectional elevation, plan and cross section of two span R.C.C. T-beam bridges from the given set of specifications.<br>**2.0 Public Health Engineering Drawings**<br>2.1 Draws the sectional elevation, plan and cross-section of public health engineering works : Septic Tank, RCC Overhead tank (Square)<br>2.2 Draw the Layout of water supply and drainage connections in residential buildings.<br>**3.0 Irrigation Engineering structure Drawings**<br>3.1 Draw the sectional elevation, plan and cross section of Earthen bunds –Homogeneous and Non Homogeneous<br>3.2 Tank surplus weir with splayed wing walls<br>3.3 Canal drop (notch type)<br>3.4 Tank sluice with tower head.<br>3.5 Canal regulator<br>**4.0 Structural Engineering Drawings**<br>4.1 Draw the sectional plan, elevation and cross section of built up beam showing the details of curtailment of plates and connection details.<br>4.2 Draw the details of built up column with lacing and batten system showing the details of connections by welding (plan, elevation with three systems of lacing/batten systems)<br>4.3 Draw the details of steel column base with details of gusset plate. Plan, section parallel to web, section parallel to flange showing the connections with welded joints. |

| | |
|---|---|
| | **5.0 MS Excel applications in Building Estimates**<br>Prepare the detailed estimates for various buildings from the given drawings, specifications and site conditions and report using MS-word for:<br>5.1 Compound wall and Steps<br>5.2 Single Room with Verandah (Load bearing structure)<br>5.3 Single storied Residential building with one bed room (1 BHK) (Load bearing structure)<br>5.4 Single storied Residential building with two bed rooms (2 BHK) (Load bearing structure)<br>5.5 Two storied residential building (Framed structure) |

**PO-CO MAPPING:**

| **Course Code : C-510** | **Course Title: CAD PRACTICE-II**<br>**Number of COs: 05** | | | | **No. of Periods: 90** |
|---|---|---|---|---|---|
| **POs** | **Mapped with CO No.** | **CO Periods addressing PO in Column 1** | | **Level (1,2,3)** | **Remarks** |
| | | **No** | **%** | | |
| PO1 | CO1, CO2, CO3, CO4,CO5 | 23 | 26 | 2 | > 40% Level 3<br>Highly addressed |
| PO2 | CO1, CO2, CO3, CO4, CO5 | 10 | 11 | 1 | |
| PO3 | CO1, CO2, CO3, CO4, CO5 | 10 | 11 | 1 | |
| PO4 | CO1, CO2, CO3, CO4, CO5 | 36 | 40 | 3 | 25% to 40% Level 2<br>Moderately addressed |
| PO5 | CO1, CO2, CO3, CO4, CO5 | 6 | 7 | 1 | |
| PO6 | | | | | |
| PO7 | CO1, CO2, CO3, CO4, CO5 | 5 | 5 | 1 | 5 to 25% Level 1<br>Low addressed |

**CO-PO MAPPING:**

| CO No. | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 3 | 2 | 3 | | 2 | 2 | 2 | 3 |
| CO2 | 2 | 3 | 2 | 3 | 3 | | 2 | 2 | 2 | 3 |
| CO3 | 3 | 2 | 2 | 3 | 2 | | 2 | 2 | 2 | 3 |
| CO4 | 2 | 2 | 2 | 2 | 2 | | 2 | 2 | 2 | 3 |
| CO5 | 3 | 3 | 3 | 2 | 2 | | 2 | 2 | 2 | 3 |
| Average | 2.4 | 2.6 | 2.4 | 2.4 | 2.4 | | 2 | 2 | 2 | 3 |

**Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**

**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc**

**COURSE CONTENT**

**1.0 Culverts and Bridge Drawings**

Preparation of Plan, cross sectional elevation and longitudinal sectional elevation of

a. Pipe Culvert (Single Pipe)
b. R.C.C. slab culvert with square returns
c. Two-span R.C.C. T-beam bridge with square walls.

**2.0 Public Health Engineering Drawings**

Preparation of Layouts of water supply & Sanitary lines in buildings

a. Sanitary block of a large building showing internal water supply and sanitary fittings and plumbing fixtures (Plan & Section across each unit)
b. Water supply & sanitary connections to a residential building
c. Septic tank with details of connection to a residential building.
d. R.C.C overhead square tank(four columns with accessories).

**3.0 Irrigation Engineering Drawings**

Preparation of Plan, cross sectional elevation and longitudinal sectional elevation of

a. Earthen bunds –

a) Homogeneous b) Non Homogeneous (Zoned embankment)

b. Tank surplus weir with splayed wing walls
c. Canal drop (notch type)
d. Tank sluice with tower head.
e. Canal regulator.

## 4.0 Structural Engineering Drawings

a) Draw the sectional plan, elevation and cross section of built up beam showing the details of curtailment of plates and connection details.
b) Draw the details of built up column with lacing and batten system showing the details of connections by welding (plan, elevation with three systems of lacing/batten systems)
**c)** Draw the details of steel column base with details of gusset plate. Plan, section parallel to web, section parallel to flange showing the connections with welded joints

## 5.0 MS Excel applications in Building Estimates

Prepare the detailed estimates for various buildings from the given drawings, specifications and site conditions:

a) Compound wall and Steps
b) Single Room with Verandah (Load bearing structure)
c) Single storied Residential building with one bed room (1 BHK) (Load bearing structure)
d) Single storied Residential building with two bed rooms (2 BHK) (Load bearing structure)
e) Two storied residential building (Framed structure)
f) Reporting using MS-Word.

# SIXTH SEMESTER

**DIPLOMA IN CIVIL ENGINEERING**
**SCHEME OF INSTRUCTION AND MODEL BLUE PRINT FOR EVALUATION**
**CURRICULUM-2020**
**SIXTH SEMESTER**
**INDUSTRIALTRAINING**

| Course Code | Course Title | Duration | Marks for Formative Assessment | Marks for Summative Assessment |
|---|---|---|---|---|
| C-601 | Industrial Training | 24 weeks | 240 | 60 |

**Time schedule**

| S.No | Code | TOPICS | Duration |
|---|---|---|---|
| 1 | C-601 | • Practical training in Industry<br>• Training Report Preparation<br>Report Preparation: Title Page, Certificate, Acknowledgements, Abstract, Contents(introduction of Industry/Organization, Organization structure, Duties of different officers in the organization, List of works undertaken by organization, Procedures adopted, M-book recording at various stages of construction, Procurement of Material, Labour & Equipment, Skills Acquired, Conclusions, Charts, Diagrams, Plans etc., pertaining to organization, Literature. | Six Months |

**COURSE OBJECTIVES:**

| Upon completion of the course the student shall be able to | |
|---|---|
| **Course Objectives** | 1. Expose to real time working environment<br>2. Enhance knowledge and skills already learnt in the institution.<br>3. Acquire new skills of measuring, supervising and recording civil engineering works.<br>4. Develop qualities like team & work culture, integrity, responsibility and self confidence. |

**COURSE OUTCOMES:**

| | | | |
|---|---|---|---|
| **COURSE OUT COMES** | CO1 | C601.1 | Apply theory to practical work situations |
| | CO2 | C601.2 | Cultivate sense of responsibility and good work habits |
| | CO3 | C601.3 | Exhibit the strength, teamwork spirit and self-confidence |
| | CO4 | C601.4 | Write report in technical projects |

**PO-CO Mapping**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | | | | 2 | | 1 | 3 | | 2 |
| CO2 | | | | | | 3 | | 3 | | 2 |
| CO3 | | | | | | 3 | | 3 | | 2 |
| CO4 | | | | | | 3 | | 3 | | 2 |

**3: High, 2: Moderate,1: Low**

**Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:**

**(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions**
**(vi) Quiz (vii) Industrial visits (viii) Techfests (ix) Mini project works (x) Library visits etc**

**LEARNING OUTCOMES:**

The student shall be able to display the following skill sets

1) Planning & scheduling of works, material & man-power
2) Preparing the designs & drawings of structures and structural components with respect to loads, strengths etc.,.
3) Preparing& reading estimates for civil engineering works.
4) Drafting Skills (Like proposal for new works, repairs for existing works, justification for proposals, Inspection /investigation reports, request for man power /equipment / Budget)
5) Developing Inter-personal relationship skills such as working as a team for a common cause.(Communication – Verbal, Non verbal ,written)
6) Supervising civil engineering works.(With respect to quality, progress rate, material & processes)
7) Identifying raw materials/tools/equipment appropriate for the nature of work and appreciate their importance, their source, mode of Transport to site etc.,(NOT For Final evaluation)
8) Recognizing and Practicing safety Measures in Construction Industry.
9) Preparing Reports pertaining to ongoing works.

**Scheme of Formative Assessment and Summative Assessment for Industrial Training**

| Assessment no | Upon completion of | By | Based on | Max Marks |
|---|---|---|---|---|
| 1 | 12 weeks | 1.The faculty concerned and 2. Training Mentor of the industry | Skill sets as given in the scheme of assessment | 120 |
| 2 | 20-22 weeks | | | 120 |
| 3.Final summative Evaluation | 23-24 weeks | 1.The faculty member concerned, 2.HoD concerned and 3.An external examiner | 1.Demonstration of any one of the skills listed in the Scheme of assessment | 30 |
| | | | 2.Training Report | 20 |
| | | | 3.Viva Voce | 10 |
| | | | TOTAL | 300 |

## Weightage of marks for Assessment of skills

**During first and second assessment of INDUSTRAL Training**

| Skill set No | Skill set | Max Marks Allotted For each skill set |
|---|---|---|
| 1 | Planning & Scheduling of works, material & man power. | 15 |
| 2 | Reading Drawings & Preparing Designs of various structural components. | 30 |
| 3 | Given drawing, Preparing Estimates | 25 |
| 4 | Supervising Civil Engg works with respect to Quality, Progress rate, Material, Processes | 20 |
| 5 | Developing interpersonal relation (Spoken & written communication) | 15 |
| 6 | Drafting skills | 15 |
| | **Total** | **120** |

**Note** : During assessment, the performance of the students shall be assessed in those skills in which the student has been trained and be awarded the marks as per the Weightage assigned as above. In case the student has undergone training in few skill sets only, then the total marks obtained shall be raised to 120 marks for the given assessment i.e. either assessment 1 or 2. However the performance of the student shall be assessed at the most skill sets listed above but not less than three skill sets.

**Illustration**: If the student has undergone training in only 4 skill sets (namely S.No. 1,2,4,5) and marks awarded during assessment is 50 out of 80 marks, then the marks of 50 shall be enhanced to 120 proportionately as (50x120/80=75)

**GUIDELINES FOR INDUSTRIAL TRAINING OF DIPLOMA IN CIVIL ENGINEERING PROGRAMME:**

1. Duration of the training: 6 months (24 Weeks).
2. Eligibility: As per SBTET norms
3. Training Area: Students may be trained in planning, Designing, Estimating, Drafting, Scheduling and executing of Civil Engineering works.
4. The candidate shall put a minimum of 90% attendance during Industrial training.
5. If the student fails to secure 90% attendance during industrial training, the student shall reappear for 6 months industrial training.
6. Formative assessment at industry shall be carried out by the Mentor from the industry, where the student is undergoing training and the in faculty in-charge (Guide) from the concerned section in the institution.
7. The Industrial training shall carry a Weightage of 300 marks and pass mark is 50% in assessments at industry (first and second assessment) and final summative assessment at institution put together i.e. 150 marks out of 300 marks.
8. If the student fails to secure 50% marks in final summative assessment at institution level, the student should reappear for final summative assessment in the subsequent board examination.
9. Final summative assessment at institution level is done by a committee including1. Head of the section ( of concerned discipline ONLY), 2.External examiner from an industry and 3. Faculty member who assessed the student during Industrial Training as members

**Roles and responsibilities of the faculty members who are assessing the students performance during industrial Training:**

1. The faculty member shall guide the students in all aspects regarding training.
2. Shall create awareness regarding safety measures to be followed in the industry during the training period, and shall check it is followed scrupulously.
3. Shall check the logbook of the students during the time of their visit for the assessment.
4. Shall monitor progress at regular intervals and make appropriate suggestions for improvement
5. Shall visit the industry and make first and second assessments as per stipulated schedule.
6. Shall assess the skill sets acquired by the students during their assessment.
7. Shall award the marks for each skill set as per the marks allotted for that skill set during final assessment at institution.
8. Shall voluntarily supplement students learning through appropriate materials like photographs, articles, videos etc.
9. Shall act as co-examiner along with external examiner.
10. Shall act as liaison between the student and mentor.
11. Shall maintain a diary indicating his observation with respect to the progress of students learning in all three domains (Cognitive, Psychomotor and Affective)

**Guidelines to the training mentor in the industry:**

1) Shall train the students in all the skill sets as far as possible.
2) Shall assess and award the marks in both the assessments along with the faculty member.
3) Shall check and approve the log books of the students.
4) Shall approve the attendance of each student at the end of the training period.
5) Shall report to the guide about student's progress, personality development or any mis behaviour as the case may be.
6) Every Teacher (including HoD if not holding any FAC) shall be assigned a batch of students of 10 to 15 for industrial training irrespective of student's placements for training.

**Department of Technical Education**
**Name of the institution**
**Industrial training assessment**

**PIN:** **Name of the student:**

| ***Skill Set Sl.No*** | ***SKILL SET*** | **Max Marks Allotted For each parameter** | **Precisely completes the task** | **Completes the task, mistakes are absent, but not Precise** | **Completes the task, Mistakes are a few** | **Makes attempt, Mistakes are many** |
|---|---|---|---|---|---|---|
| *1* | ***Planning & Scheduling of works, material & man power (15)*** | *5* | *5* | *3* | *2* | *1* |
| | *(i)Planning of the work* | *5* | *5* | *3* | *2* | *1* |
| | *(ii) Scheduling of the work* | *5* | *5* | *3* | *2* | *1* |
| | *(iii) preparing weekly/monthly Material and Manpower requirement, recording the actuals* | | | | | |
| *2* | ***Reading Drawings & Preparing Designs of various structural components (30)*** | | | | | |
| | *(i) Reading Drawings, preparing working drawing* | *15* | *15* | *10* | *9* | *6* |
| | *(ii) Preparing Designs for small elements* | *15* | *15* | *10* | *9* | *6* |
| *3* | ***Given drawing, Preparing Estimates(25)*** | | | | | |
| | *(i) Preparing Data* | *10* | *10* | *7* | *6* | *3* |
| | *(ii) Preparing Detailed cum Abstract Estimates* | *15* | *15* | *10* | *9* | *6* |
| *4* | ***Supervising Civil Engg works with respect to Quality, Progress rate, Material, Processes(20)*** | *10* | *10* | *7* | *6* | *3* |
| | *(i) Supervising Quality in work, material etc* | *10* | *10* | *7* | *6* | *3* |
| | *(ii) Supervising Progress of work, precautions etc* | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| *5* | ***Developing interpersonal relation (Spoken & written communication)(15)***<br>*(i) Teamwork and collaboration.*<br>*(ii)Communication skills* | *10*<br>*5* | *10*<br>*5* | *7*<br>*3* | *6*<br>*2* | *3*<br>*1* |
| *6* | ***Drafting skills (15)***<br>*(i) Presentation skills.*<br>*(ii) Reporting skills* | *10*<br>*5* | *10*<br>*5* | *7*<br>*3* | *6*<br>*2* | *3*<br>*1* |

- Mistakes are with reference to Technique, Procedure & precautions, while precision refers to technique, procedure, precautions, time & result

(Marks awarded in words: ..... )

Signature of the Training In-charge (Mentor)
Name
Designation

Signature of the faculty incharge (Guide)
Name
Designation