UNIVERSITY OF KERALA

B.TECH DEGREE COURSE  
(2008 SCHEME)

REGULATIONS, SCHEME AND SYLLABUS

FOR

CIVIL ENGINEERING
B.Tech Degree Course – 2008 Scheme

REGULATIONS

1. Conditions for Admission

Candidates for admission to the B.Tech degree course shall be required to have passed the Higher Secondary Examination, Kerala or 12th Standard V.H.S.E., C.B.S.E., I.S.C. or any examination accepted by the university as equivalent thereto obtaining not less than 50% in Mathematics and 50% in Mathematics, Physics and Chemistry/ Bio- technology/ Computer Science/ Biology put together, or a diploma in Engineering awarded by the Board of Technical Education, Kerala or an examination recognized as equivalent thereto after undergoing an institutional course of at least three years securing a minimum of 50 % marks in the final diploma examination subject to the usual concessions allowed for backward classes and other communities as specified from time to time.

2. Duration of the course

i) The course for the B.Tech Degree shall extend over a period of four academic years comprising of eight semesters. The first and second semester shall be combined and each semester from third semester onwards shall cover the groups of subjects as given in the curriculum and scheme of examination

ii) Each semester shall ordinarily comprise of not less than 400 working periods each of 60 minutes duration

iii) A candidate who could not complete the programme and pass all examinations within Ten (10) years since his first admission to the B.Tech programme will not be allowed to continue and he has to quit the Programme. However he can be readmitted to the first year of the programme if he/she satisfies the eligibility norms applicable to the regular candidates prevailing at the time of readmission.

3. Eligibility for the Degree

Candidates for admission to the degree of bachelor of technology shall be required to have undergone the prescribed course of study in an institution maintained by or affiliated to the University of Kerala for a period of not less than four academic years and to have passed all the examinations specified in the scheme of study

4. Subjects of Study

The subjects of study shall be in accordance with the scheme and syllabi prescribed

5. Evaluation

Candidates in each semester will be evaluated both by continuous assessment and end semester University examination. The individual maximum marks allotted for continuous assessment and University examination for each subject is as prescribed by the scheme of study.
5.1 Continuous Assessment (C.A)

The marks awarded for the continuous assessment will be on the basis of the day-to-day work, periodic tests (minimum two in a semester) and assignments (minimum of three – one each from each module). The faculty member concerned will do the continuous assessment for each semester. The C.A. marks for the individual subjects shall be computed by giving weightage to the following parameters.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Attendance</th>
<th>Tests</th>
<th>Assignments/Class Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory Subjects</td>
<td>20%</td>
<td>50%</td>
<td>30%</td>
</tr>
<tr>
<td>Drawing</td>
<td>20%</td>
<td>40%</td>
<td>40%</td>
</tr>
<tr>
<td>Practical</td>
<td>20%</td>
<td>40%</td>
<td>40%</td>
</tr>
<tr>
<td>Project Work</td>
<td>Work Assessed by Guide – 50% Assessed by a three member committee out of which one member is the guide – 50%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The C.A. marks for the attendance (20%) for each theory, practical and drawing shall be awarded in full only if the candidate has secured 90% attendance or above in the subject. Proportionate reduction shall be made in the case of subjects in which he/she gets below 90% of the attendance for a subject. The CA marks obtained by the student for all subjects in a semester is to be published at least 5 days before the commencement of the University examinations. Anomalies if any may be scrutinized by the department committee and the final CA marks are forwarded to the university within the stipulated time.

5.2. End Semester University Examinations

i) There will be University examinations at the end of the first academic year and at the end of every semester from third semester onwards in subjects as prescribed under the respective scheme of examinations. Semester classes shall be completed at least 10 working days before the commencement of the University examination.

ii) The examination will be held twice in a year – April/May session (for even semester) and October/November session (for odd semester). The combined 1st and 2nd semester is reckoned as equivalent to an even semester for the purpose of conduct of examination and the University examination will be held during April/May. However VII and VIII Semester examination will be conducted in both the sessions. This schedule will not be changed

iii) A student will be permitted to appear for the university examination only if he/she satisfies the following requirements

   a. He/she must secure not less than 75% attendance in the total number of working periods during the first year and in each semester thereafter and shall be physically present for a minimum of 60% of the total working periods. In addition, he/she also shall be physically present in at least 50% of total working periods for each subject

   b. He must earn a progress certificate from the head of the institution of having satisfactorily completed the course of study in the semester as prescribed by these regulations
c. It shall be open to the Vice-Chancellor to grant condonation of shortage of attendance on the recommendation of the head of the institution in accordance with the following norms

d. The attendance shall not be less than 60% of the total working periods

e. He/she shall be physically present for a minimum of 50% of the total working periods

f. The shortage shall not be condoned more than twice during the entire course

g. The condonation shall be granted subject to the rules and procedures prescribed by the university from time to time.

h. The condonation for combined 1st and 2nd semesters will be reckoned as a single condonation for attendance purposes.

iv) A student who is not permitted to appear for the University examinations for a particular semester due to the shortage of attendance and not permitted by the authorities for condonation of shortage of attendance shall repeat the semester when it is offered again. This provision is allowed only once for a semester.

v) The university will conduct examinations for all subjects (Theory, Drawing & Practical)

vi) The scheme of valuation will be decided by the chief examiner for theory / drawing subjects

vii) For practical examinations, the examiners together will decide the marks to be awarded. The student shall produce the certified record of the work done in the laboratory during the examination. The evaluation of the candidate should be as per the guidelines given in the syllabus for the practical subject.

6. Letter Grades

For each subject in a semester, based on the total marks obtained by the student in the University examination and Continuous assessment put together a letter grade (S, A+, A, B+, B, C+, C, D, E and F) will be awarded. All letter grades except ‘F’ will be awarded if the marks for the University examination is 40 % or above and the total mark (C.A marks + University Exam mark) is 50 % or above. No absolute mark will be indicated in the grade card. Letter grade corresponding to total marks (C.A marks + University Exam mark) and the corresponding grade point in a ten-point scale is described below.

<table>
<thead>
<tr>
<th>% of Total marks (C.A marks + University Exam mark)</th>
<th>Letter Grade</th>
<th>Grade Point (G.P)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 % and above</td>
<td>S</td>
<td>10</td>
<td>Excellent</td>
</tr>
<tr>
<td>85 % and above but less than 90%</td>
<td>A+</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>80 % and above but less than 85%</td>
<td>A</td>
<td>8.5</td>
<td></td>
</tr>
<tr>
<td>75 % and above but less than 80%</td>
<td>B+</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>70 % and above but less than 75%</td>
<td>B</td>
<td>7.5</td>
<td></td>
</tr>
<tr>
<td>65 % and above but less than 70%</td>
<td>C+</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>60 % and above but less than 65%</td>
<td>C</td>
<td>6.5</td>
<td></td>
</tr>
<tr>
<td>55 % and above but less than 60%</td>
<td>D</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>50 % and above but less than 55%</td>
<td>E</td>
<td>5.5</td>
<td></td>
</tr>
<tr>
<td>Below 50% (C.A + U.E) or below 40 % for U.E only</td>
<td>F</td>
<td>0</td>
<td>Failed</td>
</tr>
</tbody>
</table>
7. Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA)

Grade point average is the semester wise average points obtained by each student in a 10-point scale. GPA for a particular semester is calculated as per the calculation shown below.

\[
GPA = \frac{\sum \text{Credit} \times \text{GP obtained for the subject}}{\sum \text{credit for subject}}
\]

Cumulative Grade point Average (CGPA) is the average grade points obtained by the students till the end of any particular semester. CGPA is calculated in a 10-point scale as shown below.

\[
CGPA = \frac{\sum \text{Credits for semester} \times \text{GPA obtained for the semester}}{\sum \text{credits for the semester}}
\]

GPA and CGPA shall be rounded to two decimal points. The Grade card issued to the students shall contain subject number and subject name, credits for the subject, letter grades obtained, GPA for the semester and CGPA up to that particular semester. In addition to the grade cards for each semester all successful candidate shall also be issued a consolidated statement grades. On specific request from a candidate and after remitting the prescribed fees the University shall issue detailed mark to the individual candidate.

8. Minimum for a pass

a) A candidate shall be declared to have passed a semester examination in full in the first appearance if he/she secures not less than 5.5 GPA with a minimum of ‘E’ grade for the all individual subject in that semester.

b) A candidate shall be declared to have passed in an individual subject of a semester examination if he/she secures grade ‘E’ or above.

c) A candidate who does not secure a full pass in a semester examination as per clause (a) above will have to pass in all the subjects of the semester examination as per clause (b) above before he is declared to have passed in that semester examination in full.

9. Improvement of Grades

i) A candidate shall be allowed to re-appear for a maximum of two subjects of a semester examination in order to improve the marks and hence the grades already obtained subject to the following conditions

a) The candidate shall be permitted to improve the examination only along with next available chance.

b) The candidate shall not be allowed to appear for an improvement examination for the subjects of the VII & VIII semesters.

c) The grades obtained by the candidate for each subject in the improvement chance he has appeared for or the already existing grades – whichever is better will be reckoned as the grades secured.

d) First & Second semester will be counted as a single chance and they can improve a maximum of three subjects
ii) A candidate shall be allowed to repeat the course work in one or more semesters in order to better the C.A. marks already obtained, subject to the following conditions:
   a) He/she shall repeat the course work in a particular semester only once and that too at the earliest opportunity offered to him/her.
   b) He/she shall not combine this course work with his/her regular course work.
   c) He/she shall not be allowed to repeat the course work of any semester if he has already passed that semester examination in full.
   d) The C.A marks obtained by the repetition of the course work will be considered for all purposes.

iii) A candidate shall be allowed to withdraw from the whole examination of a semester in accordance with the rules for cancellation of examination of the University of Kerala.

10. Classification of Successful candidates

i) A candidate who qualifies for the degree passing all the subjects of the eight semesters within five academic years (ten consecutive semesters after the commencement of his/her course of study) and secures not less than 8 CGPA up to and including eighth semester (overall CGPA) shall be declared to have passed the B.Tech degree examination in FIRST CLASS WITH DISTINCTION.

ii) A candidate who qualifies for the degree passing all the subjects of the eight semesters within five academic years (ten consecutive semesters after the commencement of his/her course of study) and secures less than 8 CGPA but not less than 6.5 CGPA up to and including eighth semester shall be declared to have passed the B.Tech degree examination in FIRST CLASS.

iii) All other successful candidates shall be declared to have passed the B.Tech Degree examination in SECOND CLASS.

iv) Successful candidates who complete the examination in four academic years (eight consecutive semesters after the commencement of the course of study) shall be ranked branch-wise on the basis of the CGPA in all eight semesters put together. In the case of a tie in the CGPA, the total marks of the students who have got the same CGPA shall be considered for finalizing the rank. Students who pass the examination in supplementary examination are also covered under this clause.

11. Educational Tour

a) The students may undertake one educational tour preferably after fourth semester of the course and submit a tour report.

b) The tour may be conducted during the vacation / holidays taking not more than 5 working days, combined with the vacation / holidays if required. Total number of Tour days shall not exceed 15 days.

c) The tour period shall be considered as part of the working periods of a semester.

12. Revision of Regulations

The university may from time to time revise, amend or change the regulations, curriculum, scheme of examinations and syllabi. These changes unless specified otherwise, will have effect from the beginning of the academic year / semester following the notification of the University.
### Combined I and II Semesters
(Common for all branches)

<table>
<thead>
<tr>
<th>Course No</th>
<th>Name of subject</th>
<th>Weekly load, hours</th>
<th>Max sessional marks</th>
<th>Exam Dur Hrs</th>
<th>Exam max marks</th>
<th>Credits</th>
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<td>08.103</td>
<td>Engineering Chemistry</td>
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<td>08.104</td>
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<td>08.105</td>
<td>Engineering Mechanics</td>
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<td>08.106</td>
<td>Basic Civil Engineering</td>
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<td>08.107</td>
<td>Basic Mechanical Engineering</td>
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<td>Basic Electrical and Electronics Engineering</td>
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<td><strong>1000</strong></td>
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The subject 08.109 will be handled by the Department of Electronics and Communication Engineering.

### Third Semester

<table>
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<tr>
<th>Course No:</th>
<th>Subject</th>
<th>Credit</th>
<th>L</th>
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<th>P/D</th>
<th>Sessional Marks</th>
<th>University Exam. Hrs</th>
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<tr>
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<td>Engineering Mathematics (CMPUNERFHBTA)</td>
<td>4 3 1</td>
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<tr>
<td>08.302</td>
<td>Mechanics of Structures</td>
<td>4 3 1</td>
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<td></td>
<td>-</td>
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<td>08.303</td>
<td>Fluid Mechanics- I</td>
<td>4 3 1</td>
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<td>08.304</td>
<td>Concrete Technology</td>
<td>3 2 1</td>
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<td>08.305</td>
<td>Surveying I</td>
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<td>Engineering Geology</td>
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<td>08.307</td>
<td>Building Technology &amp; Drawing</td>
<td>4 2 -</td>
<td></td>
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<td>-</td>
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<td>08.308</td>
<td>Practical Surveying – I</td>
<td>2 - -</td>
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<td>Course No:</td>
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<td>Credit</td>
<td>L</td>
<td>T</td>
<td>P/D</td>
<td>Sessional Marks</td>
<td>University Exam. Hrs.</td>
<td>University Exam. Marks</td>
<td>Total Marks</td>
</tr>
<tr>
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<td>08.401</td>
<td>Engineering Mathematics – III (CMPUNERFHB)</td>
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<td>-</td>
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<td>08.402</td>
<td>Humanities (CTAFRHB)</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>-</td>
<td>50</td>
<td>3</td>
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<td>08.403</td>
<td>Structural Analysis - I</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>50</td>
<td>3</td>
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<tr>
<td>08.404</td>
<td>Fluid Mechanics – II</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>50</td>
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<tr>
<td>08.405</td>
<td>Surveying II</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>50</td>
<td>3</td>
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<tr>
<td>08.406</td>
<td>Building Planning &amp; Drawing</td>
<td>5</td>
<td>1</td>
<td>4</td>
<td>-</td>
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<td>3</td>
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<tr>
<td>08.407</td>
<td>Strength of Materials Lab.</td>
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<td>-</td>
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<td>08.408</td>
<td>Fluid Mechanics Lab.</td>
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<table>
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<tr>
<th>Course No:</th>
<th>Subject</th>
<th>Credit</th>
<th>L</th>
<th>T</th>
<th>P/D</th>
<th>Sessional Marks</th>
<th>University Exam. Hrs.</th>
<th>University Exam. Marks</th>
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<tr>
<td>08.501</td>
<td>Engineering Mathematics - IV</td>
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<td>3</td>
<td>1</td>
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<td>08.502</td>
<td>Design of Reinforced Concrete Structures</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>-</td>
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<td>08.503</td>
<td>Structural Analysis – II</td>
<td>5</td>
<td>3</td>
<td>2</td>
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<td>08.504</td>
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<td>Urban Planning and Architecture</td>
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<td>Elective I</td>
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### Sixth Semester

<table>
<thead>
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<th>Course No:</th>
<th>Subject</th>
<th>Credit</th>
<th>L</th>
<th>T</th>
<th>P/D</th>
<th>Sessional Marks</th>
<th>University Exam. Hrs.</th>
<th>University Exam. Marks</th>
<th>Total Marks</th>
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### Seventh Semester

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### List of Electives

#### Elective-I (Vth semester)

08.506.1 Modern Construction Materials  
08.506.2 Geomatics  
08.506.3 Free Surface Flow  
08.506.4 Environmental Science and Management  
08.506.5 Advanced concrete technology

#### Elective-II (VIth Semester)

08 606.1 Soil Exploration  
08 606.2 Solid Waste Management  
08 606.3 Wave Hydro dynamics  
08 606.4 Advanced Computational Methods  
08 606.5 Traffic Engineering  
08 606.6 Valuation of Real Properties  
08 606.7 Sustainable Development  
08 606.8 Hydrology & Water Resources  
08 606.9. Nano Science & Nano Technology  
08 606 10 Natural Disaster Management  
08.606.11 Communicative English and Technical Writing
Elective-III (VIIth Semester)

08.705.1 Theory of Elasticity
08.705.2 Earth Dam Engineering
08.705.3 Deep Foundations
08.705.4 Structural Analysis for Dynamic Loads
08.705.5 Wind loading on structures
08.705.6 Air quality Management
08.705.7 Personnel Management
08.705.8 Design of Offshore Structures
08.705.9 Urban water Management and Environmental Hydraulics
08.705.10 Pre-stressed Concrete
08.705.11 Highway and Airfield Pavement Materials
08.705.12 Artificial Intelligence Methods

Elective-IV (VIIIth Semester)

08.806.1 Design of Steel Concrete Composite structures
08.806.2 Design of Port, Harbour and Coastal structures
08.806.3 Design and Construction of pavements
08.806.4 Advanced Foundation Engineering
08.806.5 Finite Element Methods
08.806.6 Probabilistic Methods in Civil Engineering
08.806.7 Ground Water Engineering
08.806.8 Repair & Rehabilitation of Structures
08.806.9 Ground Improvement
08.806.10 Earthquake resistant design of structures
08.806.11 Environmental Impact Assessment
08.806.12 Instrumentation for Engineering Measurements

Elective-V (VIIIth Semester)

08.807.1 Geotechnical earthquake Engineering
08.807.2 Foundations on Expansive Soils
08.807.3 Industrial Waste Water Management
08.807.4 Design of Bridges
08.807.5 Transportation Planning
08.807.6 Materials Management
08.807.7 Optimization Techniques in Engineering.
08.807.8 Irrigation and drainage Engineering
08.807.9 Transportation system management
08.807.10 Reinforced Earth
08.807.11 Industrial Structures
08.807.12 Geo Environmental Engineering
08.807.13 Systems engineering for civil engineers
Syllabus for Combined I&II Semester

08-101 ENGINEERING MATHEMATICS- 1

L-T-P : 2-1-0

Credits: 6

MODULE- 1

Applications of differentiation:- Definition of Hyperbolic functions and their derivatives- Successive differentiation- Leibnitz’ Theorem(without proof)- Curvature- Radius of curvature- centre of curvature- Evolute ( Cartesian ,polar and parametric forms)
Partial differentiation and applications:- Partial derivatives- Euler’s theorem on homogeneous functions- Total derivatives- Jacobians- Errors and approximations- Taylor’s series (one and two variables) - Maxima and minima of functions of two variables - Lagrange’s method- Leibnitz rule on differentiation under integral sign.
Vector differentiation and applications :- Scalar and vector functions- differentiation of vector functions- Velocity and acceleration- Scalar and vector fields- Operator \( \nabla \) - Gradient- Physical interpretation of gradient- Directional derivative- Divergence- Curl- Identities involving \( \nabla \) (no proof) - Irrotational and solenoidal fields – Scalar potential.

MODULE-II

Laplace transforms:- Transforms of elementary functions - shifting property- Inverse transforms- Transforms of derivatives and integrals- Transform functions multiplied by t and divided by t - Convolution theorem(without proof)-Transforms of unit step function, unit impulse function and periodic functions-second shifting theorem- Solution of ordinary differential equations with constant coefficients using Laplace transforms.

MODULE-III


REFERENCES
2. Peter O’Neil ; *Advanced Engineering Mathematics*, Thomson
5. Michel D Greenberg; *Advanced Engineering Mathematics*,Pearson International
MODULE-I

Oscillations and Waves

Electromagnetic Theory
Del operator – grad, div, curl and their physical significance. Concept of displacement current. Deduction of Maxwell’s equations. Prediction of electromagnetic waves. Transverse nature of electromagnetic waves. E and H are at right angles. Poynting’s theorem (qualitative only)

Physics of Solids

MODULE- II

Interference of Light

Diffraction of Light

Polarization of Light

Special Theory of Relativity

MODULE – III

Quantum Mechanics

Statistical Mechanics

Laser

REFERENCE:
1. Sears & Zemansky ; University Physics. XI Edn., Pearson
2. Frank & Leno; Introduction to Optics. III Edn., Pearson
3. J.C. Upadhyaya; Mechanics, Ram Prasad & Sons
4. David J Griffiths; Introduction to Electrodynamics, III Edn, Pearson
5. M Ali Omar; Elementary Solid State Physics, Pearson
6. S O Pillai; Solid State Physics, New Age International Publishers
7. John R Taylor, Chris D Zafiratos & Michael A Dubson; Modern Physics for Scientists and Engineers. II Edn, Prentice Hall of India
8. Eugene Hecht; Optics, IV Edn, Pearson
9. Robert Resnick; Introduction to Special Relativity, John Willey and Sons
10. Richard L Liboff; Introduction to Quantum Mechanics, IV Edn, Pearson
11. Donald A Mcquarrie; Statistical Mechanics, Vivo Books
12. Mark Ratner & Daniel Ratner; Nanotechnology.
13. T.A. Hassan et al; A Text Book of Engineering Physics, Aswathy Publishers, Trivandrum
14. B. Premlet; Advanced Engineering Physics, Phasor Books, Kollam.

LIST OF DEMONSTRATION EXPERIMENTS
5. Laser – Diffraction at a narrow slit.
6. Laser – Diffraction at a straight wire or circular aperture.
11. Computer stimulation – study of E & H. (Gauss’ law & Ampere’s law)

Pattern of Question Paper
University examination is for a maximum of 100 marks, in 3 hour duration. The syllabus is spread in 3 modules. The question paper will consist of two parts (A and B).

Part A contains short answer questions for 40 marks. This part contains 10 questions without any choice, each of 4 marks (uniformly taken from all modules).

Part B contains long answer questions for 60 marks. From each module, this part contains 3 questions out of which 2 are to be answered, each of 10 marks. Long answer questions from all the 3 modules will form 60 marks.
08.103 ENGINEERING CHEMISTRY

L-T-T: 2-1-0
Credits: 6

MODULE-1


Corrosion and its control- Theories of corrosion (chemical corrosion and electrochemical corrosion)- Galvanic series- Types of corrosion (Concentration cell corrosion, Stress corrosion, Galvanic corrosion) - Factors affecting corrosion (nature of metal and nature of environment) and different methods of corrosion control (corrosion inhibitors, cathodic protection). (5hrs)

Protective coatings- Metallic coatings- Chemical conversion coatings- paint (4hrs)


MODULE-2

Water treatment- Types of hardness- Degree of hardness- Related problems- Estimation of hardness- by EDTA method- Sludge and scales in boilers- Priming and foaming- Boiler corrosion-Water softening methods, Lime-soda process, Ion exchange methods-Internal treatments (colloidal, carbonate, phosphate and calgon conditioning)- Domestic water treatment- Methods of disinfection of water-Desalination process (Reverse osmosis, electro dialysis- Distillation). (12hrs)

Environmental damages and prevention- Air pollution- CFCs and ozone depletion- Alternative refrigerents-Green house effect-Water pollution- BOD and COD- Waste water treatment- Aerobic - Anaerobic and USAB processes. (3hrs)

Thermal methods of analysis-Basic principles involved in Thermo gravimetry, Differential thermal analysis and applications. (2hrs)

Spectroscopy- Molecular energy levels-Types of molecular spectra- Electronic spectra (Classification of electronic transitions- Beer Lamberts law, Vibrational spectra (mechanism of interaction and application), Rotational spectra (Determination of bond length and application). NMR spectra (Basic principle, chemical shift, spin-spin splitting) (6hrs)

Chromatography- General principles- High performance liquid chromatography- Gas chromatography. (2hrs)

MODULE-3

Polymers- Classifications- Mechanism of polymerization (Addition, free radical, cationic, anionic and coordination polymerization)- Thermoplastics and thermosetting plastics-Compounding of plastics-Moulding techniques of plastics (Compression, Injection, Transfer and Extrusion moulding)-Preparation, properties and uses of PVC, PVA, PMMA, Nylon, PET, Bakelite, Urea formaldehyde resin- Silicon polymers- Biodegradable plastics. Elastomers- structure of natural rubber- vulcanization- synthetic rubbers (Buna-S, Butyl rubber and Neoprene) (12hrs)

Organo electronic compounds -Super conducting and conducting organic materials like Polyaniline, polyacetylene and polypyrryl and its applications. (2hrs)

Fuels- Calorific value- HCV and LCV-Experimental determination of calorific value-Theoretical calculation of calorific value by Dulong’s formula - Bio fuels -Bio hydrogen and Bio-diesel (5hrs)

Lubricants- Introduction-Mechanism of lubrication- solid and liquid lubricant- Properties of lubricants- Viscosity index- flash and fire point- cloud and pour point- aniline value. (4hrs)

Cement- Manufacture of Portland cement- Theory of setting and hardening of cement (2hrs)

LAB-EXPERIMENTS (DEMONSTRATION ONLY)
1. Estimation of total hardness in water using EDTA.
2. Estimation of chloride ions in domestic water.
3. Estimation of dissolved oxygen.
4. Estimation of COD in sewage water.
5. Estimation of available chlorine in bleaching powder.
8. Determination of flash and fire point of a lubricating oil by Pensky Marten’s apparatus.
12. Determinations of pH using glass electrode and quinhydrion electrode.

REFERENCES
1. H.A. Willard, L.L. Merrit and J.A. Dean ;”Instrumental methods of analysis’
2. A.K. De ; “Environmental Chemistry”
3. K.J.Klauhunde; ”Nanoscale materials in chemistry”
4. B.R. Gowariker ; “Polymer science”
5. B.W.Gonser ; “Modern materials”
6. V.Raghavan; “Material Science and engineering. A first course”
7. L.H. Van Vlack ; “Elements of Material science and Engineering”
8. J.W.Goodby ; “Chemistry of liquid crystals”
9. S.Glasstone ; “A text book of physical chemistry”
10. P.C. Jain; ‘Engineering Chemistry”
11. Juhaina Ahad ; “Engineering Chemistry”
14. J.C. Kuriakose and J. Rajaram ; “Chemistry of Engineering and Technology volume I & II”
08.104 ENGINEERING GRAPHICS

L- T-D: 1-0-2         CREDITS: 6

INTRODUCTION: Introduction to technical drawing and its language. Lines, lettering, dimensioning, scaling of figures, symbols and drawing instruments. (1 sheet practice)

MODULE 1

PLAIN CURVES: Conic sections by eccentricity method. Construction of ellipse: (i) Arc of circles method (ii) Rectangle method (ii) Concentric circles method. Construction of parabola (i) Rectangle method (ii) Tangent method. Construction of hyperbola (i) Arc of circles method (ii) given ordinate, abscissa and the transverse axis (iii) given the asymptotes and a point on the curve. Construction of Tangent and Normal at any point on these curves

MISCELLANEOUS CURVES: Construction of Cycloid, Epicycloid and Hypocycloid, Involute of a circle. Archimedian spiral, Logarithmic spiral and Helix. Construction of Tangent and Normal at any point on these curves

PROJECTION OF POINTS AND LINES: Types of projections, Principles of Orthographic projection. Projections of points and lines. Determination of true length, inclination with planes of projection and traces of lines.

MODULE II

PROJECTION OF SOLIDS: Projection of simple solids such as prisms, pyramids, cone, cylinder, tetrahedron, octahedron, sphere and their auxiliary projections.

SECTIONS OF SOLIDS: Types of cutting planes, section of simple solids cut by parallel, perpendicular and inclined cutting planes. Their projections and true shape of cut sections.

DEVELOPMENT OF SURFACES: Development of surfaces of (i) simple solids like prisms, pyramids, cylinder and cone (ii) Cut regular solids.

MODULE III

ISOMETRIC PROJECTION: Isometric scale, Isometric view and projections of simple solids like prisms, pyramids, cylinder, cone sphere, frustum of solids and also their combinations.

INTERSECTION OF SURFACES: Intersection of surfaces of two solids as given below.
   (i) Cylinder and cylinder
   (ii) Prism and prism.
   (iii) Cone and Cylinder
(Only cases where the axes are perpendicular to each other and intersecting with or without offset.)


CAD: Introduction to CAD systems, Benefits of CAD, Various Soft wares for CAD, Demonstration of any one CAD software.

General Note:
(i) First angle projection to be followed
(ii) Question paper shall contain 3 questions from each module, except from CAD. Students are required to answer any two questions from each module.
(iii) Distribution of marks
Module -I  2 x 16 = 32
Module -II  2 x 17 = 34
Module III  2 x 17 = 34

REFERENCES
1. Luzadder and Duff; Fundamentals of Engineering Drawing
2. N. D. Bhatt; Engineering Drawing
3. K. Venugopal; Engineering Drawing and Graphics
4. P.S. Gill; Engineering Graphics
5. P.I. Varghese; Engineering Graphics
6. K.R. Gopalakrishnan; Engineering Drawing
7. Thamaraselvi; Engineering Drawing
8. K.C. John; Engineering Graphics
9. K.N. Anil Kumar; Engineering Graphics
MODULE I (20 HRS)
Idealizations of Mechanics- Elements of vector algebra
Statics of rigid bodies-Classification of force systems- principle of transmissibility of a force- composition and resolution- Resultant and Equilibrant of coplanar concurrent force systems-various analytical methods- Lami’s theorem, method of resolution- Conditions of equilibrium-
Moment of a force, couple, properties of couple- Varignon’s theorem- Resultant and equilibrant of coplanar non-concurrent force systems- Conditions of equilibrium. Equilibrium of rigid bodies-free body diagrams.(simple problems)
Types of supports - types of beams - types of loading- Support reactions of simply supported and overhanging beams under different types of loading.
Forces in space, equations of equilibrium, Vector approach.

MODULE II (20 HRS)
Properties of surfaces- centroid of composite areas- Theorems of Pappus-Gouldinus- Moment of inertia of areas, Parallel and perpendicular axes theorems- Radius of Gyration- moment of inertia of composite areas.
Dynamics: Kinematics-Combined motion of translation and rotation-instantaneous centre, motion of link, motion of connecting rod and piston, wheel rolling without slipping.
Relative velocity - basic concepts-analysis of different types of problems
Kinetics- Newton’s laws of translatory motion- D’Alembert’s principle- Motion of lift- Motion of connected bodies.

MODULE III (20 HRS)
Collision of elastic bodies-Law of conservation of momentum-Direct and oblique impact between elastic bodies and impact with fixed plane.
Curvilinear motion- D’Alembert’s principle in curvilinear motion- Mass moment of inertia of rings, solid discs and solid spheres (no derivations required)Angular momentum-Angular impulse.
Kinetics of rigid bodies under combined translatory and rotational motion – work – energy principle for rigid bodies.
Centrifugal and centripetal forces – motion of vehicles on curved paths in horizontal and vertical planes – super elevation – stability of vehicles moving in curved paths (qualitative ideas only).

REFERENCES:

Note
Question For University Examination:- Part A – 8 compulsory questions covering entire syllabus, 5 marks each.
(5 x 8 = 40) Part B – Three questions of 10 marks from each module, out of which two should be answered (10 x 2 x 3 = 60).
MODULE I

Surveying: Object and Principles of Surveying.
Linear Measurements: Direct measurements - Tape & chain only - Ranging out survey lines-Taking measurements of sloping ground - Errors - Tape correction (problems).
Levelling: Levelling instruments - Level (Dumpy Level, Tilting Level ) Levelling Staff. Measurements in levelling - Temporary adjustments of a level, holding the staff, reading the staff - Principles of leveling - recording measurements in the field book - reduction of level - height of collimation method only (simple examples).
Contour maps (Brief description only). Computation of areas - Mid ordinate rule, average ordinate rule, Trapezoidal rule, Simpson’s rule (examples)- Introduction to Distomat, Total Station & GPS (Brief description only)

MODULE II

Building construction: Selection of site for buildings - types of buildings - Components of buildings.
Foundation: Different types - Spread footing, Isolated footing, Combined footing, Mat foundation, Pile foundation (description only).
Safe Bearing Capacity of Soil: Importance of determination of the Safe Bearing Capacity of Soil (brief description only).
Super structure: Masonry - stone masonry, brick masonry –Types- desirable qualities of stone and brick.
Partition: Materials used for making partition - plywood, particle boards & glass.
Doors, windows & ventilators : Types - materials used for the construction of doors and windows - wood, steel & Aluminium.
Plastering: Mortar – properties - Preparation of Cement mortar
Roofing: Selection of type of roof -flat roof, sloping roof -Concrete roof, tiled roof. Selection of roof covering materials. GI Sheet , AC Sheet, PVC Sheet

MODULE III

Concrete: Ingredients- cement, aggregate, and water. Qualities of ingredients (brief description only).
Tests on Cement - consistency, initial and final setting times. Compressive strength -IS Specifications.
Aggregates – desirable qualities of fine and coarse aggregates
Steel-common types used in construction- Mild Steel, HYSD Steel and their properties.
Reinforced Cement Concrete (RCC)-advantages of RCC over Plain Cement Concrete.
Elementary ideas on pre-cast and pre-stressed concrete constructions.
Building services – vertical transportation – stairs – types, escalators and elevators, ramps (brief description only). Plumbing services- brief description of water supply and sewage disposal arrangements for residential buildings.

REFERENCE:
8. Jha and Sinha, “Construction and Technology”

10. Santha Minu, “Basic Civil Engineering” Karunya Publications, Trivandrum

Note: The question paper will consist of two parts. Part I and part II.
Part I is Compulsory covering the entire syllabus, for 40 marks. It contains 8 questions of 5 marks each.
Part II is to cover 3 modules. There will be three questions of 10 marks from each module, out of which two should be answered.
MODULE I
Thermodynamics: Basic concepts and definitions of Zeroth law, First law, Second law of thermodynamics- concept of reversibility and entropy, p-v and T-s diagrams
Air cycles: Carnot, Otto and Diesel cycles-Air standard efficiency (simple problems)
IC Engines: Working and comparison of two stroke and four stroke petrol and diesel engines - general description of various systems using block diagrams – air system, fuel system, ignition system and governing system. A brief description of CRDI, MPFI, GDI and Hybrid Vehicles
Steam boilers: Classification – Cochran boiler, Babcock and Wilcox boiler, Benson boiler- fluidized bed combustion,

MODULE II
Principles and fields of application of - compressors - reciprocating and centrifugal, blower, pumps- reciprocating, centrifugal and jet pumps, steam and hydraulic turbines- impulse and reaction, gas turbine cycles- open and closed
Elementary ideas of hydro electric, thermal and nuclear power plants
Refrigeration & Air Conditioning: Refrigerants, CFC free refrigerants. Vapor compression refrigeration system, Comfort and Industrial air conditioning-typical window air conditioning unit (general description only).

MODULE III
Mechanical Power transmission systems: Belt, rope and gear drives-types, comparison and fields of application-velocity ratio-slip (simple problems) friction disc, single plate clutch, gear trains (no derivations).
Manufacturing processes: Elementary ideas of casting, forging, rolling, welding, soldering and brazing
Machining processes- turning, taper turning, thread cutting, shaping, drilling, grinding, milling (simple sketches and short notes).
Non conventional machining - Electro discharge machining (EDM) and Electro chemical machining (ECM)
Principle, application and advantages of C N C machine

REFERENCES
2. Gill, Smith and Zuirys, “Fundamentals of IC Engines”
3. Amstead, Ostwald and Begeman, “Manufacturing processes”
5. Roy and Choudhary, “Elements of Mechanical Engineering”
6. Hajra Choudhary, “Workshop Technology”
7. R K Bensal, “Fluid mechanics and machines”

Note: Lectures are to be supplemented by demonstration in laboratories.

Note: The question paper will consist of two parts. Part I is to be compulsory for 40 marks. This may contain 10 questions of 4 marks each. Part II is to cover 3 modules. There can be 3 questions from each module (10 marks each) out of which 2 are to be answered.
08.108 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

L-T-P:2–1-0  Credits 6

MODULE – I


Alternating current fundamentals - generation of alternating currents – waveforms - frequency - period - average and rms values - form factor. Phasor representation of alternating quantities - rectangular polar and exponential forms.

Analysis of simple ac circuits – concept of impedance and admittance - phasor representation - j notation - power and power factor in ac circuits - active and reactive components. Solution of RL, RC and RLC series circuits.

Three phase systems - generation of three phase voltage - star and delta connection - relation between phase and line values of voltage and current - phasor representation - three wire and four wire systems.

Measurement of power in three phase circuits (two wattmeter method). Measurement of energy – working of 1-phase energy meter.

MODULE – II

Transformers - Principle of operation - EMF equation - constructional details of single phase and three phase transformers

Methods of bulk generation of electric power. Block schematic of layout of generating stations - hydroelectric, thermal and nuclear power plants. Renewable energy sources - solar, wind, tidal, wave and geothermal energy.

Bulk transmission of electric power - typical electrical power transmission scheme - need for high transmission voltage - substations - substation equipments. Primary and secondary transmission and distribution systems

Different methods of wiring for LT installations. Schematic layout of LT switchboards. Earthing of installations - necessity of earthing - plate and pipe earthing. Protective fuses, MCBs, ELCBs and switches.

Working of incandescent lamps, -fluorescent lamps, energy efficient lamps

MODULE – III

Diodes - PN junction diodes,. V-I characteristics, dynamic & static resistance, principle of working and V-I characteristics of Zener diode, principle of Photo diode, Solar cell, & LED.

Rectifiers & power supplies - block diagram description of a dc power supply, circuit diagram & working of half-wave & full wave rectifier, final equations of Vrms, Vdc, ripple factor and peak inverse voltage in each case, principle of working of series inductor and shunt capacitor filters. Working of simple zener voltage regulator.

Power devices – V – I characteristics and applications of SCR and Triac  Working principle of UPS and SMPS

Transducers – Resistance strain guage, thermistor, LVDT

REFERENCES

5. TP Imthias Ahmed, B. Premlet, “Introduction to Electrical Engineering”, Phaser Books, Kollam

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**Note:** The question paper will consist of two parts. Part – A is to be compulsory for 40 marks (10 questions of 4 marks each). Part-B is to cover 3 modules for 60 marks. (50% choice- One out of two or two out of four from each module).
08.109 BASIC COMMUNICATION AND INFORMATION ENGINEERING

L – T – P: 2-1-0

Credits: 6

MODULE 1 (Qualitative Treatment)

(a) Bipolar junction transistors: NPN & PNP transistors, structure, typical doping, working of NPN transistor, concepts of common base, common emitter & common collector configurations, current gain of each, input & output characteristics of common emitter configuration, comparison of three configurations with reference to voltage & current gain, input & output resistances and applications. (6 hrs)

(b) Field effect Transistors: basic principles of JFET, MESFET and MOSFET, comparison with BJT. (3 hrs)

(c) Amplifiers & Oscillators: circuit diagram & working of common emitter amplifier, function of each component in the circuit, need of proper biasing, frequency response, voltage gain and 3dB bandwidth, concepts of class A, B, AB and Class C power amplifiers, circuit diagram & working of push pull amplifiers, concepts of feedback, working principles of oscillators, circuit diagram & working of RC phase shift oscillator (7 hrs)

(d) Integrated circuits: advantages of ICs, analog and digital ICs, functional block diagram of operational amplifier, ideal operational amplifier, use as inverting amplifier, non inverting amplifier, summing amplifier, integrator and comparator. (4 hrs)

(e) Digital ICs: logic gates, realization of logic functions, principle of combinational and sequential logic circuits, flip flop (JK), logic families: TTL and CMOS Logic (No internal diagram) (4 hrs)

(f) IC Fabrication: purification of silicon, crystal growth, wafer preparation. unit process: oxidation, diffusion, ion implantation, epitaxy, deposition, photolithography. (4 hrs)

MODULE 2 (Qualitative Treatment)

(a) Measurements: principle and block diagram of analog and digital multimeter, working principle of CRT, block diagram of CRO, measurements using CRO, principle of digital storage oscilloscope, principle and block diagram of function generator. (5 hrs)


(c) Color television: TV Standards, interlaced scanning, block diagram of PAL TV transmitter & receiver, basic principles of cable TV, CCTV system, basic principles of HDTV, basic principles of LCD & Plasma displays. (5 hrs)

(d) Radar and navigation: principle of radar and radar equation, block schematics of pulsed radar, factors affecting range, applications of radar in measurements and navigation. (4 hrs)

(e) Satellite communication: microwave frequency bands, concept of geo-stationary satellite, frequency bands used, satellite transponder, block diagram of earth station transmitter & receiver, advantages of satellite communication, principle of Global Positioning System (GPS). (3 hrs)

(f) Optical communication: block diagram of the optical communication system, principle of light transmission through fiber, concepts of Single Mode and Multi Mode optical fiber, working principle of source (semiconductor Laser) & detector (PIN,APD), advantages of optical communication. (5 hrs)

MODULE 3 (Qualitative Treatment)

(a) Computer Architecture: functional units: basic concept of ALU- data path and control, memory hierarchy, caches, main memory, virtual memory, operating systems, microprocessors - functional block diagram of 8085 (9 hrs)

(b) Data communication: overview, analog and digital data transmission, transmission media, digitization of wave forms, PCM, digital modulation techniques- ASK, PSK, FSK, basic concepts of error detection , parity checking. (6 hrs)

(c) Mobile communication: basic principles of cellular communications, concepts of cells, frequency reuse, principle and block diagram of GSM,principle of CDMA, WLL & GPRS technologies. (4 hrs)

(d) Internet Technology: concepts of networking: client - server computing, IP addresses, domain names, network interface unit - modem, switching technologies- circuit switching and packet switching,
LAN, MAN, WAN & World wide web, network topologies, communication protocols-TCP/IP, Introduction to web languages-HTML, XML, internetworking concepts, network devices- basic principles of router, bridge, switch, network security- Firewall. (7 hrs)

REFERENCES
1. Santiram Kal, Basic Electronics – Devices, Circuits and IT fundamentals, PHI
2. Louis E. Frenzel, Principles of Electronic Communication Systems, TMH
4. M. Moris Mano, Computer Architecture, PHI
5. Neil H E Weste, Kamran Eshraghian, Principles of CMOS VLSI design – A system perspective, Pearson Education [Module 1(f)]
6. David A. Bell, Electronic Instrumentation and Measurements, PHI [Module 2(a)]
7. N N Bhargava, D C Kulshreshtha, S C Gupta, Basic Electronics & Linear Circuits, TMH
9. R.R. Gulati, Monochrome and Colour Television, New Age International [Module 2(c)]

This subject shall be handled by faculty of Dept. of Electronics and Communication in the Colleges.

Question Paper:
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.


C: Sheet Metal Work: Study of tools. Selection of different gauge GI sheets for jobs. Practice on riveted joints. Preparing tube joints, frustums, trays and containers.

D. Plumbing: Study of tools. Details of plumbing work in domestic and industrial applications. Study of pipe joints, cutting, threading and laying of pipes with different fittings using PVC pipes. Use of special tools in plumbing work.

E: Foundry: Study of tools. Preparation of sand, moulding practice and demonstration of casting.


G: Smithy: Study of tools. Demonstration on forging of square prism, hexagonal bolt, T bolt and Eye bolt.


NOTE: For the university examination the student shall be examined in sections A, B, C, D and E only.
Syllabus for III Semester

08. 301 ENGINEERING MATHEMATICS-II
(CMPUNERFHHTA)

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Module I

Module II
Fourier series: Fourier series of periodic functions of period \(2\pi\) and \(2l\). Dirichlet’s condition for convergence. Odd and even functions. Half range expansions.
Fourier Transforms: Fourier integral theorem (no proof) - Fourier transforms - Fourier sine and cosine transforms, inverse Fourier transforms, properties

Module III

References

Question Paper: Duration: 3 hours

Note: The question paper shall consists of two parts.
Part A (40 marks) Ten compulsory questions of 4 marks each.
Part B (60 marks) Student must answer one out of two from each module. Each question carries 20 marks.
Module I

Module II
Analysis of pin-jointed plane frames by the method of joints and sections.
Introduction to analysis of beams - Concept of bending moment and shear force - Relationship connecting intensity of loading, shear force and bending moment – Shear force and bending moment diagrams for cantilever, simply supported and overhanging beams for different loadings such as point load, UDL, uniformly varying load and applied moment – Theory of simple bending – Limitations – Flexural Rigidity - Bending stress distribution in beams of different cross-sections – Moment of resistance – Composite beams – Beams of uniform strength - Shear stress distribution in beams of different cross-sections – Introduction to shear centre and shear flow (concept only – no numerical examples).

Module III

Strain energy – Strain energy due to normal stress, shear stress and bending stress – Instantaneous stresses and strains due to suddenly applied and impact loading.

References

Question Paper: Duration: 3 hours
The Question paper contains Part A and Part B.
Part A carries 8 compulsory questions (short answer questions) covering the entire syllabus and is for 40 marks.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question out of two.
Note: No charts, tables, codes are permitted in the Examination hall .If necessary relevant data shall be given along with the question paper by the question paper setter.
**Module I**

Review of Fluid properties, Classification of fluids, Newtonian and Non Newtonian fluids.(No questions to be asked)

Fluid statics: Fluid pressure, variation of pressure in a fluid, measurement of pressure using manometers-simpe manometers, differential manometers, pressure measurement using mechanical gauges. Pressure head forces on immersed plane and curved surfaces. Pressure distribution diagram for vertical surfaces, Practical application of total pressure –Dams and gates.

Buoyancy and Floatation: Buoyant force, stability of floating and submerged bodies, metacentre and metacentric height, analytical and experimental determination of metacentric height

Kinematics of fluids: Methods of describing fluid motion, Lagrangian and Eulerian methods, Types of fluid flow, steady and unsteady flow, uniform and non-uniform flow, one, two and three dimensional flow, laminar and turbulent flow, rotational and irrotational flow, stream line, path line, streak lines, conservation of mass, equation of continuity in one, two and three dimensions, (Derivation in Cartesian co-ordinate system)

**Module II**

Acceler Introduction to structural analysis – Concept of determinate, indeterminate structures and stability – deflection of beams – Moment-curvature relation – Load-deflection differential equation – Slope and deflection of beams by the method of successive integration – Macaulay’s ation of fluid particle, convective and local acceleration, circulation and vorticity, velocity potential, stream function, equipotential lines, flow net, uses of flow net.

Factors influencing motion: Euler’s equation of motion and integration of Euler’s equation of motion along a streamline, Bernoulli’s Equation, Energy and Momentum correction factors, vortex motion, free and forced vortex. Applications of Bernoulli’s equation, Pitot tube, Venturimeter and orifice meter.

Pipe flow: Major and minor energy losses, Darcy-Weisbach equation, hydraulic gradient and total energy line, pipe connecting reservoirs-pipes in series, pipes in parallel, equivalent pipe, siphon, transmission of power through pipes, nozzles and nozzle diameter for maximum power transmission.

**Module III**

Flow through orifices: Different types of orifices, Flow over a sharp edged orifice, Hydraulic coefficients – Experimental determination of these coefficients, Flow through large rectangular orifice, Flow through submerged orifices, flow under variable heads, time of emptying.

Flow through mouthpieces: Types of mouthpieces, flow through an external mouthpiece, flow through convergent divergent mouthpiece, flow through internal mouthpiece.

Flow over weirs: Types of weirs flow over rectangular sharp crested weir, Francis formula, Flow over a trapezoidal weir, Cipolletti weir, broad crested weir, submerged weirs, proportional weir, time of emptying through weirs.

Viscous flow: Laminar flow through circular pipes, Hagen Poiseuille equation, Reynolds experiment. Laminar flow between two stationary parallel plates.

Boundary layer theory-no slip condition, boundary layer thickness, boundary layer growth over long thin plate, laminar, turbulent boundary layer, laminar sub layer, Momentum integral equation of boundary layer (no derivation), Blasius boundary layer equations for laminar and turbulent boundary layer, computation of drag on a flat plate. Separation of boundary layer.

**References:**


**Question Paper:**

The Question paper contains Part A and Part B.

**Part A** carries 8 compulsory questions (short answer questions) covering the entire syllabus and is for 40 marks. **Part B** is for 60 marks. There will be two questions from each module. The candidate has to answer one question out of two.

**Note:** No charts, tables, codes are permitted in the Examination hall. If necessary relevant data shall be given along with the question paper by the question paper setter.
Module I

Materials: Cement – Ingredients, Chemical composition, basic properties of cement compounds,hydration of cement- heat of hydration, physical properties of Portland cements, Indian standard tests and specification, various types and grades of cement, storage of cement

Aggregates: Classification of aggregates based on size, shape, unit weight and its geological origin. Characteristics of aggregates – Strength of aggregate, particle shape and texture, specific gravity, bulk density, porosity, moisture content of aggregate, bulking of fine aggregate, deleterious substance in aggregate, soundness of aggregate , alkali- aggregate reaction , sieve analysis:- grading curves, fineness modulus, grading requirements, grading of fine and coarse aggregates, zoning, IS tests and specification for aggregates for concrete.

Water: - Quality of mixing water, effect of impurities in water on properties of concrete.

Admixtures: - Functions and classification of admixtures, factors influencing the dosage of different admixtures- IS specification for admixtures for concrete.

Module II

Properties of fresh concrete: - Water/ Cement ratio and its significance in fresh concrete- workability- different methods for assessing workability according to IS Specification, factors affecting workability, requirements of workability for various work, segregation, bleeding, setting, hardening, strength development.


Special concrete (Brief discussion only): Lightweight concrete, High strength concrete, Polymer concrete, fiber reinforced concrete, Fero-cement, Ready mixed concrete.

Formwork for concrete: - Materials used for formwork- formwork for beams, columns, slabs.

Module III


Non-destructive testing of concrete: -Rebound hammer and ultrasonic pulse velocity testing


References:
1  A.M.Neville, Concrete Technology- Pearson Education
2 A.M.Neville, Properties of Concrete 4/e, Pearson Education
4 M.S.Shetty, Concrete Technology , S I Chand & Company.
5 Gambhin M.L., Concrete Technology, Tata McGraw Hill
6 Krishna Raju N., Design of Concrete Mixes, CBS publishers
7 A. R. Santhakumar, Concrete Technology , Oxford University Press,India(2006)

Question Paper: Duration: 3 hours
The question paper consists of Part A and Part B.

Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering entire syllabus

Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question of 20 marks from each module.

Note: No charts, tables, codes are permitted in the Examination hall .If necessary relevant data shall be given along with the question paper by the question paper setter.
Module I

**Compass Surveying** – Prismatic Compass only – Bearing of survey lines – Method of booking – Magnetic dip and declination – Local attraction – Latitude and departure – Traverse, adjustment of closing error by different methods – Traverse Computation – Omitted measurements and area Computation from latitude and departure.

**Plane table Surveying** – Accessories of plane table equipment and their uses – Setting up of plane table,– method of plane tabling – radiation, intersection, resection and traversing – Two and three point problems – their practical application and methods of solution – Advantages and disadvantages of plane table surveying – errors in plane table – precaution to be taken.

Module II

**Leveling** – Principles of leveling – Methods of leveling – Spirit leveling, Booking and Reducing levels – Profile leveling, Reciprocal leveling – cross sectioning- Curvature and refraction – Sensitiveness of bubble tube – Difficulties in leveling – errors in leveling, Precise leveling


**Volumes** – Methods of computations – Prismsoidal and Trapezoidal formula – Prismsoidal correction – Curvature corrections for volumes Mass diagram – Construction of mass diagram – Characteristics of mass diagram- lead and lift – Calculation of reservoir capacity – Uses of mass diagram.

Module III


**Tacheometric Surveying** – Principles – Methods – Studia System – Fixed and Movable hair methods – Methods with staff held vertical and normal– Determination of instrument constants. Tangential system

**Hydrographic Survey**-Sounding-Different methods of locating sounding -Three point problem- analytical method.

References:

1. Prof. T.P.Kenetkar & Prof. S.V.Kulkarni - Surveying and Levelling , Pune Vidyarthi Griha Prakashan,2004
2. Dr. B.C.Punmia , Ashok Kumar Jain & Arun Kumar Jain  - Surveying , Laxmi publications (P)Ltd ,2005

**Question Paper:** Duration: 3 hours
The Question paper contains Part A and Part B.

**Part A** carries 8 compulsory questions (short answer questions) covering the entire syllabus and is for 40 marks.

**Part B** is for 60 marks. There will be two questions from each module. The candidate has to answer one question out of two.

**Note:** No charts, tables, codes are permitted in the Examination hall .If necessary relevant data shall be given along with the question paper by the question paper setter.
Module I
Scope of Geology in Civil Engineering and scope of Geological Engineering Subdivisions of Geology.
Exogenous and Endogenous geological processes and their relevance in civil engg. Interior of the Earth.
Basic concepts of Continental drift hypothesis and Plate tectonics theory.
Soil genesis-Weathering : Factors , agents , types , products and engineering significance of weathering.
Soil profile , Geologic classifications of soils , Soil erosion and Soil conservation measures.
Rivers : Erosion , transportation and deposition. Major Erosional and Depositional Landforms
Oceans : Coastal landforms , Marine erosion and Coastal protection.
geological hazards:  Landslides – Types , causes and prevention ; Landslides of Kerala  Earthquakes –
Terminology and classifications , Safety factor

Module II
Definition and physical properties of minerals.
Physical properties and Chemical composition of : Quartz , Feldspars (Orthoclase , microcline and plagioclase) ,
Micas ( Biotite and Muscovite) , Amphibole (Hornblende only) , Pyroxenes ( Augite and Hypersthene) , Olivine
, Sillimanite , Garnet , Talc , Gypsum , Calcite , Dolomite , Clay minerals ( Kaolinite only )
Genetic divisions of rocks , rock cycle.
Brief account of texture , structure and classifications of igneous , sedimentary and metamorphic rocks. Brief
study of Granite , Gabbro , Dolerite , Basalt , Pegmatite, Sandstone , Limestone , Shale , Granulite , Gneiss,
Schist , Slate , Marble and Quartzite . rock types of Kerala . Engineering properties of rocks used as site rocks ,
building stones and aggregates

Module III
Attitude of rocks and Geological structures – strike and dip , Brunton compass. Terminology ,classification and
engineering significance of Folds , Faults , Joints and Unconformities.
Major geological factors to be considered in the construction of Dams and Reservoirs , Tunnels , Building
foundations , Bridges and Transportation routes. Hydrogeology-occurrence of ground water-types of aquifers.
Geophysics: Electrical resistivity seismic refraction methods.
Geoinformatics-Basic principles of Remote sensing , Geographic Information Systems and Global Positioning
Systems.

References:

Question Paper: Duration: 3 hours
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering entire
syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one
question of 20 marks from each module.
Note: No charts, tables, codes are permitted in the Examination hall .If necessary relevant data shall be given
along with the question paper by the question paper setter.
Module I

Building stones – Building stones - properties and uses of granite and laterite stones
quarrying- Dressing of stones, Stones masonry – Various types of masonry (Review only)
Brick masonry - Bricks - Classifications , dimensions as per ISS, strength requirements - different tests as per
ISS. Brick bond - English, Flemish bond 1, 1/2 brick walls, load bearing walls.
Timber :- Characteristics of good timber- properties and uses - seasoning of timber, different methods for
seasoning of timber- common defects - treatment of timber - strength requirements - tests as per ISS -
commonly used timber for building construction.
Tiles :- flooring & Roofing tiles – specifications, common tests as per ISS. (Review only)
Reinforcing steel :- Common types used in construction. Mild steel rods HYSD and TMT, steels- properties
and its uses- strength requirements and test as per ISS, structural steel - different shapes - strength requirements
-Applications. (Review only)
Aluminium alloy:- properties and it uses- strength requirements

Module II

Scaffolding, Shoring and Underpinning: Scaffolding – parts of scaffolding – types of scaffolding – points to
be kept in view of scaffolding – shoring – types of shoring – underpinning – methods of underpinning timbering
of trenches. Doors, windows & ventilators - various types. Hardware fittings.
Stairs:- different types and its components, Arches lintels and weather Shades- various types
Construction equipment:- Earth moving equipment, Excavators, Bulldozer, Power shovels, Dumper, Rollers
and Compactors, Aggregate Crushers. Pile Driving equipment.

Module III (Drawing)

General – Study of IS codes of practice on building drawing, Symbols for various materials
Doors, Windows And Ventilators – Sectional plan, Sectional elevation, Front view and joint details of doors –
Panelled, Glazed and flush, Glazed wooden windows and ventilators.
Roofing - Elevation and joint details of lean-to roof, coupled and collar roof, King post, Queen post trusses with
A.C. and tile roofing – Steel (French) roof truss with A.C. sheet roofing
Stairs – Plan and sectional elevation of RCC of Dog legged stairs.
RCC lintel and sunshade – longitudinal and cross section.
Footing- Isolated and combined footing

References:
1. Chudley, Construction Technology Vol. 1,2,3 & 4
4. Jah & Singha, Construction and Technology
5. Shaw and Kale Building Drawing, , Tata McGraw Hill

Note: Minimum 8 sheets must be drawn

Question Paper: Duration: 3 hours
Part A carries 4 compulsory questions (short answer questions) covering Modules I and II and is for 20 marks.
Part B is for 40 marks. There will be two questions each from Modules I and II. The candidate has to answer
one question out of two.
In Part C (Drawing) , there will be two questions carrying 40 marks each from Module III. The candidate has to
answer one question in full.

Notes:
1. Question for Part C (Drawing) should be set such that the student will be able to complete the drawing
within one hour duration. No charts, tables, codes are permitted in the examination hall. If necessary,
relevant data shall be given along with the question paper by the question paper setter.
2. For the calculation of sessional marks this paper is to be considered as a drawing paper.
1. Chain survey & compass survey– Study of instruments , ranging etc. - 1 class.

2. Plane table survey – Radiation, intersection, traversing ,
   two point problem, Three point problem etc  - 4 class.

3. Levelling – H.I. method Rise and fall method  - 3 class.

4. Theodolite survey study of instrument, measurement of
   Horizontal angle, problems in distance only  - 2 class

5. Study of Instruments: Electronic Theodolite, Automatic Levels, Distance meter,
   Subtense bar, Planimeter ,minor instruments etc.  - 1 class

6. Class test  - 2 class

Note: University examination from Plane table survey and levelling only

Duration 3 Hours, Max . Marks 100
Syllabus for IV Semester

08. 401 ENGINEERING MATHEMATICS-III

Module I

Complex Differentiation: Limits, continuity and differentiation of complex functions. Analytic functions-Cauchy Reimann equations in Cartesian form (proof of necessary part only) properties of analytic functions-harmonic functions. Milne Thomson method

Conformal mapping: The Transformations \( w = \frac{1}{z} \), \( w = z^2 \), \( w = z + \frac{1}{z} \), \( w = \sin z \), \( w = \cos z \), Bilinear transformation

Module II

Complex Integration: Line integral- Cauchy’s integral theorem-Cauchy’s integral formula. Power series-radius of convergence-Taylors and Laurents series-zeros and singularities-Residues and residue theorem. Evaluation of real definite integrals-

\[
\int_{-\infty}^{\infty} f(x) \, dx \quad \text{with no poles of } f(z) \text{ on the real axis (proof of theorems not required)}
\]

Module III


References
1. Advanced Engineering Mathematics, Peter v. O’neil (Thomson)
3. Advanced Engineering Mathematics, Greenberg (Pearson)
6. Numerical Methods with programming in C T.Veerarajan and T.Ramachandran
7. Introductory methods of numerical analysis. S.S.Sastry

Question Paper: Duration: 3 hours
Note: The question paper shall consists of two parts.
Part A (40 marks) Ten compulsory questions of 4 marks each.
Part B (60 marks) Student must answer one out of two from each module. Each question carries 20 marks.
PART-I  ECONOMICS (2 periods/week)

Module I
Definition of Economics – Basic Concepts Goods – Choice of techniques – Production possibility curve
Primary – Secondary, Tertiary Sector – Significance of Money.
Meaning of Demand and Supply – Types of demand – Determinants of Demand – Demand forecasting
Production function – Law of Variable proportion – Returns to scale - Least cost combination of inputs –
Cost concepts – Cost output relationship

Module II
Inflation – causes of inflation – measures to control inflation – Demand – Pull inflation – cost push inflation
– effects of inflation – effects of inflations comparison between inflation and deflation
Applicability of Keynesian Theory to UDC’S.
Stock Market and present scenario – Industrial sector past and present – Industry Analysis – Electronics –
Chemical – Automobile – FMCG Industry.

Environment and Development – Basic Issues – Sustainable Development and Environmental Accounting –
Population – Resources and the Environment – Poverty and the Environment – Growth versus the

PART II - ACCOUNTANCY (1 period/week)

Module III
Book- Keeping and Accountancy -Elements of Double Entry -Book- Keeping-rules for journalizing -Ledger
accounts –Cash book-Banking transactions – Trial Balance- Method of Balancing accounts- the journal proper
(simple problems).
Final accounts: Preparation of trading and profit and loss Account- Balance sheet (with simple problems) -
Introduction to Accounting packages (Description only)

References:
house,NewDelhi
5. Rudder Dutt and K.P.M.Sundaran,Indian Economy, S.Chand & Co.
8. Batliboi - Double Entry book Keeping
9. Dr K.G. Chandrasekharan Nair - A Systematic approach to Accounting

University question:
Note: Part I and Part II  to be answered in separate answer books.

Part – I. Economics
Part A – 30 Marks (short answers) covering entire syllabus (3x10=30)
Part B – 40 marks (50% choice one out of two or two out of four from each module)

Part – II. Accountancy
Three questions covering entire syllabus out of which two questions have to be answered (2x15=30)
Module I


Introduction to energy methods – Strain energy and complementary energy – Castigliano’s theorems - Application of theorem to statically determinate beams and rigid-jointed plane frames. Introduction to structural analysis – Concept of determinate, indeterminate structures and stability – deflection of beams – Moment-curvature relation – Load-deflection differential equation – Slope and deflection of beams by the method of successive integration

Module II


Module III

Elastic stability of slender columns – Euler’s formula for long columns with different end conditions – Limitations of Euler’s formula – Rankine’s formula – Columns subjected to eccentric loading. Influence lines – Influence line diagram for reactions, shear force and bending moment in simply supported and cantilever beams and overhanging beams – Moving loads – Maximum effects under distributed loads, two concentrated loads and series of concentrated loads – Absolute maximum shear force and bending moment – Shear force and bending moment envelope – Equivalent uniformly distributed load – Influence lines for member forces in statically determinate trusses.

References


Question Paper: Duration: 3 hours

The question paper consists of Part A and Part B.

Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering syllabus.

Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question of 20 marks from each module.
Module I

Flow in open channels-types of channels, types of flow, geometric elements of channel section, velocity distribution in open channels, uniform flow in channels, Chezy’s equation, Kutters and Bazin’s equations, Mannings formula. Most economic section for rectangular, trapezoidal and triangular channels. Condition for maximum discharge and maximum velocity through circular channels. Computations for uniform flow, normal depth, conveyance of a channel section, section factor for uniform flow.

Specific energy, critical depth, discharge diagram. Computation of critical flow, Section factor for critical flow. Specific force, conjugate or sequent depths, hydraulic jump, expression for sequent depths and energy loss for a hydraulic jump in horizontal rectangular channels, types of jump, length of jump, height of jump, uses of hydraulic jump.

Module II

Gradually varied flow, dynamic equation for gradually varied flow, different forms of dynamic equation, classification of surface profiles, Backwater and drawdown curves, characteristics of surface profiles in prismatic channels. Computation of length of surface profiles, direct step method.

Dimensional analysis and model studies-dimensions, dimensional homogeneity, methods of dimensional analysis, Rayleigh method, Buckingham method, dimensionless numbers, Similitude. geometric, kinematic and dynamic similarities. Model laws-Reynold’s and Froude model laws, scale ratios, types of models, distorted and undistorted models, scale effect in models.

Momentum equation and its applications-linear momentum equation, application to one dimensional flow-forces on bends- momentum equation for steady flow—moment of momentum equation.

Module III

Hydraulic Machines-Impulse momentum principle, impact of jets, force of a jet on fixed and moving vanes. Turbines-classification and comparison of velocity triangles for Pelton wheel and reaction turbines(Francis and Kaplan), work done and efficiency, characteristic curves, specific speed, draft tube-different types, penstock, surge tank-types, cavitation in turbines.

Pumps-Centrifugal pumps-types, work done, efficiency, minimum speed, velocity triangle for pumps, specific speed, priming, characteristic curves, multi-stage pumps.

Reciprocating pumps, working of a reciprocating pump, types, work done in single acting and double acting pumps, coefficient of discharge, slip, effect in velocity due to acceleration and frictional resistance, indicator diagram, separation in suction and delivery pipes, air vessels, work saved by air vessels, rate of flow into and from air vessels.

References:


Question Paper: Duration: 3 hours
The question paper consists of Part A and Part B.

Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering syllabus.

Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question of 20 marks from each module.
Module I


Module II


Field Astronomy: - Terrestrial latitude and longitude, Celestial Sphere-Astronomical triangle, Co-ordinate system

Module III

Photogrammetry – Terrestrial and Aerial photogrammetry – heights and distances from photographic measurement – flight planning - Vertical Photograph – Geometry and scale of vertical photographs – Ground coordinates from vertical photographs- Relief displacement – Planimetric mapping from vertical photos – different methods- Stereoscopy and parallax – Different types of stereoscopes - Photomaps and Mosaics.

Electro magnetic distance measurement (EDM) – Principle of EDM -Types of EDM instruments – Distomat – Total Station – Principle – procedure and Surveying using Total Station – Data retrieval and processing

References:
2. Prof. T.P.Kenetkar and Prof. S.V.Kulkarni - Surveying and Levelling, PuneVidyarthi Griha Prakashan, 2004
3. Dr. B.C.Punmia, Ashok kumar Jain & Arun Kumar Jain - Surveying, Laxmi publications (P)Ltd, 2005

Question Paper: Duration: 3 hours
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question of 20 marks from each module.
Note: No charts, tables, codes are permitted in the Examination hall .If necessary relevant data shall be given along with the question paper by the question paper setter.
Module I
Detailed discussion on Building bye-laws.
Elements of Computer Aided Drawing-Lines-Curves-Geometric shapes-Text-Dimensioning
Setting Out of Building, Computation of Plinth Area, Carpet Area, Covered Area ratio, Floor Area Ratio,
Computation of storage capacity of rain water harvesting system as per norms, CRZ rules

Module II
Preparation of working drawings (from line sketches or from specifications) of different types of buildings namely
   (i) Single storeyed buildings with flat roof, pitched roof and partly pitched and partly flat roof
   (ii) Two-storeyed and multi-storeyed buildings
   (iii) Public utility buildings like hostel, hospital, library etc. and
   (iv) Industrial building.
Preparation of lay-out plan of house drainage for a given building.
Preparation of site plans and service plans as per building rules.
Preparation of working drawings from specifications for different types of culvert namely - slab culvert and box culvert.
Using a computer software (AutoCAD/ Micro station etc.) draw the plan, section and elevation of a residential building.

References:
1. National Building Code of India
2. Kerala Municipal Building Rules
4. Balagopal T.S. Prabhu - Building Drawing and Detailing, Spades, Calicut

Note 1: The student should know the local (Panchayath/Corporation) building rules and should be in a position to prepare sketch design for clients and submission drawing for approval. As a term paper, at the end of the semester, each student should design and prepare a submission drawing in tracing paper for a proposed residential building.

Note 2: Minimum 10 sheets must be drawn, out of which at least 2 should be computer print-outs on building details. In the distribution of sessional mark, 25% weightage in marks for class work should be given to the term paper mentioned in Note 1. and 25% for drawings using computer software.

University exam pattern: Duration – 3 hrs.
The question paper shall consist of two parts.
Part A – Compulsory 4 short answer questions covering the entire portion for 20 marks.
Part B – Two questions carrying 80 marks each covering Module II. Students should answer any one question in full.
08. 407  STRENGTH OF MATERIALS LAB

1. Study of UTM, Torsion, Hardness and Impact Testing Machines
2. Test on M S, Tor steels
3. Shear test on M S Rod
4. Torsion test on M S Rod
5. Torsion test using Torsion Pendulum on M S, Aluminum and Brass wires.
6. Izod and Charpy Impact Test
7. Hardness tests (Rockwell and Brinell)
8. Spring test (open and close coiled)
9. Bending test on wood
10. Determination of E of wood and steel and verification of Clark Maxwell’s Law of Reciprocal Deflection

Examinations: Duration 3 Hours, Max. Marks 100

08. 408  FLUID MECHANICS LAB

1. Study of pipe fitting, plumbing tools, water meters, current meters, manometers and pressure gauges
2. Study and Experiment on orifices, mouthpieces, notches, orifice meter and venturimeter.
3. Study and Experiment on reciprocating and centrifugal pumps
4. Study and Experiment on Hydraulic turbines.
5. Note: Sufficient experiments shall be given depending upon the facilities available in the laboratory

Examinations: Duration 3 Hours, Max. Marks 100
Syllabus for V Semester

08.501 ENGINEERING MATHEMATICS – IV

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Module I

Discrete and continuous random variables and their probability distributions - Probability distribution (density) functions - Distribution functions - Mean and Variance - Simple problems. - Binomial, Poisson, uniform and exponential distributions - Mean and Variance of the above distributions - Normal distribution - Properties of normal distribution - Computing probabilities using Binomial, Poisson, uniform, exponential and normal distributions

Module II

Curve fitting - Principle of least squares - Fitting a straight line - Fitting a parabola - Linear correlation and regression - Karl Pearson’s coefficient of correlation - Sampling distributions - Standard error - Estimation - Interval estimation of population mean and proportions (small and large samples) - Testing of Hypothesis - Hypothesis concerning a mean, Equality of means - Hypothesis concerning one proportion, difference of two proportions.

Module III


References

1. T. Veerarajan, Probability and Random Processes, TMH
2. Richard A. Johnson, Probability and statistics for engineers, Pearson
3. G. Hadly, Linear Programming, Addison Wesley
4. Ravindran, Philips, Solberg, Operations Research, Wiley
5. Dr.B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers

Question Paper:
The question paper shall consist of two parts. Part A (40 marks) shall contain 10 compulsory questions of 4 marks each. Part B (60 marks) will have 3 modules. There shall be 2 questions from each module (20 marks each) out of which one is to be answered
Module I

Module II

Module III

References:
2. N.Krishnaraju,’Structural Design and Drawing - Reinforced Concrete and Steel’, Universities Press Ltd.
3. Ashok K Jain ,’Reinforced Concrete Limit State Design .Nem Chand Brothers, Roorkee
5. S.N.Sinha, Reinforced Concrete Design Tata McGraw- Hill
6. N.Krishnaraju, Prestressed Concrete Tata McGraw- Hill

Question Paper: Duration : 3 hours
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering the entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question of 20 marks from each module.
Use of IS 456:2000; IS 1343 and Interaction curves for columns are permitted in the examination hall.
Module I

Module II
Concept of kinematic indeterminacy and their determination in beams, rigid-jointed frames and pin-jointed frames - Kinematically indeterminate beams – Introduction to displacement method of analysis – Slope-deflection method for beams and rigid jointed plane frames (with and without sway) including frames with sloping legs – Effect of settlement of supports – Moment Distribution method for beams and rigid jointed plane frames (with and without sway) – Effect of support settlement – Kani’s method for beams and rigid jointed plane frames of different geometry (with and without sway) – Introduction to approximate methods of analysis for multistoreyed frames - Substitute frame method – Cantilever method – Portal method (No numerical examples in approximate methods)

Module III

References:

Question paper: Duration : 3 hours
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering the entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question of 20 marks from each module.

Note: No charts, tables, codes are permitted in the Examination hall .If necessary relevant data shall be given along with the question paper by the question paper setter.
08.504 TRANSPORTATION ENGINEERING – I

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Module I

Introduction- Classification and characteristics of transportation modes- Comparison of railway and highway transport
Railway track- Alignment-requirements of good alignment-Factors in selection of good alignment. Requirements of an ideal permanent way- capacity of a railway track- Gauges in railway track- selection-uniformity of gauge-railway track cross-sections-coning of wheels
Sleepers-Functions-requirements-timber, metal and concrete sleepers-sleeper density
Ballast-functions-requirements-types
Rail fixtures and fasteners-purpose and types-modern elastic fastenings.

Geometric design of tracks-Necessity -gradients-grade compensation on curves-radius and degree of a curve-super elevation-cant deficiency-equilibrium speed-safe speed on curves-negative super elevation-necessity of providing transition curve-length of transition curve- widening of gauge on curves

Module II

Traction and tractive resistances-Comparison of tractions-Tractive resistances-train resistances-resistance due to track profile, resistance due to starting and acceleration, wind resistance-Hauling capacity of a locomotive-Tractive effort of a locomotive-Problems
Points and Crossings-Necessity-Left and Right hand turn outs-switches-types- crossings. Design of turn outs.
Track junctions-Types (General awareness only). Design of crossovers between parallel tracks-Design of diamond crossing.

Signalling-Objectives-Classification and characteristics, types
Control systems of train movement-ATC, CTC only-Track circuiting -Interlocking of signals and points- necessity and functions -Methods-mechanical, electrical methods

Stations and yards-Classification of railway stations, platforms, loops, sidings, station yards, passenger yards, level crossings

Modern trends on railways-modernization of traction , track , trends in track vehicles (general awareness only)

Module III

Tunnelling- Necessity of tunnels, size and shape of tunnels-Construction systems of tunnels-vertical shaft system, pilot tunnel system-Methods of construction in rocks-full face method, heading and benching method, drift method. Methods of tunneling in soft grounds-liner plate method, compressed air method-Removal of excavated materials. Tunnel lining- necessity, objects, materials (General awareness only)

Ventilation and Drainage of tunnels

Harbours- Classification-Requirements of commercial harbour-typical layout with general features-factors controlling harbour size-location and width of entrance-Stevenson’s formula for entrance width-Depth of harbour and approach channel-shape of harbour. Meteorological phenomena-Wind, tides, Waves-wave parameters, fetch, Characteristics of wave, Stevenson’s formula, Wave action-Coastal currents-littoral drift Breakwater-classification- forces acting on breakwater construction. Marine facilities- wharf, pier, fenders, dolphins, aprons, transit shed, warehouse, (General awareness only). Docks- functions-wet and dry docks-floating dry dock- lock gates (General awareness only). Navigational aids- beacons-buoys-lighthouse-light ship-moorings-off shore moorings. Dredging-types-choice of dredger

References:

Question Paper: Duration: 3 hours

The question paper consists of Part A and Part B.

Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering entire syllabus. Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question of 20 marks from each module.

Note: No charts, tables, codes are permitted in the Examination hall .If necessary relevant data shall be given along with the question paper by the question paper setter.
Module I

Module II

Module III
Introduction to the concept and issues of Sustainable Architecture – basic concepts of Green Buildings – energy efficiency in buildings( brief description only ) – resource conservation and sustainable construction – various rating systems for the assessment of sustainability - Indian systems TERI GRIHA, LEED India rating – Sustainable building practices in India.

References:
5. Percy Brown, Indian Architecture _ Islamic Period, D.B. Taraporevala
10. R. Ramachandran , Urbanization and Urban System in India

Question Paper: Duration 3 hours
The question paper consists of Part A and Part B. Part A is for 40 marks. There will be 8 compulsory short answer questions covering entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question of 20 marks from each module.
Module I

Module II
Recent developments in the use of glass, plastics, asbestos, wood products, adhesives, polymer composites and composite materials- definition, characteristics, classifications based on structure and matrices. Smart composites- advantages and limitations. History, production and areas of application of the above materials.

Module III
Materials for thermal and acoustic insulation- properties-decorative finishes. Construction materials from industrial waste and recycled materials-areas of applications-

innovation in materials technology

References:

Question paper:
Duration: 3 Hours

The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short questions of 5 marks each covering the entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question from each module.
Module I

Module II

Module III
GPS Basics-system overview-working principle of GPS-Satellite ranging-calculating position-Ranging errors and its correction-code phase and carrier phase measurements-application of GPS Surveying methods-Static, Rapid static, Kinematic methods -Real time and post processing DGPS-GPS Survey planning and observation-horizontal and vertical control-data sheet-visibility diagram-GPS data processing-WAAS system-Hydrographic surveying with GPS.

References

Question paper
Duration: 3 Hrs
The Question paper consists of Part A and Part B.
Part A carries 8 compulsory questions (short answer questions) covering the entire syllabus and is for 40 marks.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question out of two.
Note: No charts, tables, codes are permitted in the Examination hall. If necessary relevant data shall be given along with the question paper by the question paper setter.
**Module I**
Open channel flow-Velocity and pressure distribution- energy & momentum correction factors- Pressure distribution in curvilinear flows. Energy and Momentum principle-critical flow, Application of specific energy principle to channel transitions with hump or change in width. Uniform flow-composite sections, Hydraulic exponents N and M.-computation of uniform flow.

**Module II**

**Module III**
Hydraulic jump-jumps in non rectangular channels-exponential channels-jump on a sloping floor-location of jump, use of jump as an energy dissipater. Ogee spillway-uncontrolled crests-profile. Standing wave flume, parshall flume, sluice gate. Stilling basin-practical features to be considered in the design of stilling basin-jump position, tail water conditions, and jump types-USBR Type II (Description only). Rapidly varied unsteady flow –Positive surges, Negative surges.

**References:**

**Question paper:**
**Duration:** 3 hrs.

The question paper consists of Part A and Part B.
**Part A** is for 40 marks. There will be 8 compulsory short answer questions of 4 marks each covering the entire syllabus.
**Part B** is for 60 marks. There will be two questions from each module. The candidate has to answer one question from each module.
**Note:** No charts, tables, codes are permitted in the Examination hall. If necessary the same shall be given along with the question paper by the question paper setter.
Module I
Natural resources of Environment – water, land and energy.

Module II
Ecology – Ecosystem – Types, Functions, Productivity, Energy Flow and Food chains
Sustainable development – Social, economical and environmental dimensions
Global environmental issues – Green house effect, ozone layer depletion, Global warming, Acid rain, deforestation.

Module III
Waste Management – Air Pollution – Sources, Types, Effects, Air Quality Standards
Water Pollution – Characteristics of water pollution – Water Quality Standards.
Waste Management hierarchy – Benefits of Pollution Prevention
Resource conservation – Good house keeping practice, Applications of remote sensing and GIS in environmental management.

References:
3. P. Aarne Vesilind and Susan M Morgan, “Introduction to Environmental Engineering”

Question paper : Duration : 3 Hrs
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering entire syllabus.
Part B is for 60 marks. There will be 2 questions form each module. The candidate has to answer one question from each module.
Note: No charts, tables, codes are permitted in the Examination hall. If necessary the same shall be given along with the question paper by the question paper setter.
Module I
Cements: Review of cements including blended cements, chemical composition; tests on chemical and physical properties; process of hydration.
Aggregates: Review of types; production of artificial aggregates; sampling and testing; effects on properties of concrete; special aggregates.
Chemical Admixtures: Review of types and classification; actions and interactions; usage; effects on properties of concrete; methods of test; applications.
Mineral Admixtures: Flyash, ground granulated blast furnace slag, metakaolin, rice-husk ash and silica fume; chemical composition; physical characteristics; effects on properties of concrete; methods of test; applications.

Module II
Special concrete: Lightweight concrete; autoclaved aerated concrete; no-fines concrete; lightweight aggregate concrete and foamed concrete.
High strength concrete; refractory concrete; high density and radiation-shielding concrete; Polymer concrete; fibre reinforced concrete; Ferro-cement; recycled aggregate concrete; Prepacked concrete.

Module III
Non-destructive testing of concrete - Surface Hardness, Ultrasonic, Penetration resistance, Pull-out, pull-off and break-off methods, Chemical testing for chloride and carbonation
Mix Design: Factors considered in the design of mix design of low and medium strength mixes. Introduction to ACI, FM, Road Note No.4 Methods, Mix design of High strength, High density concrete, Light weight concrete and Ready mix concrete.

References:
1. A. R. Santhakumar ‘Concrete Technology’, Oxford University Press
2. Shetty M.S., ‘Concrete Technology’, S.Chand &Co.
3. Neville,’Properties of Concrete’, Prentice Hall, Newyork
11 Bungey, Millard, Grantham – The Testing of Concrete in Structures- Taylor and Francis
12 IRC Highway Research Board – State of the Art: Non-Destructive Testing Techniques of Concrete Bridges

Question Paper:
Duration: 3 hours
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question of 20 marks from each module.
Note: No charts, tables, codes are permitted in the Examination hall .If necessary relevant data shall be given along with the question paper by the question paper setter.
08.507  PRACTICAL SURVEYING - II

Theodolite survey

1. Problems in heights and distances using:
   - Tangential and stadia tacheometry
   - Trigonometric levelling

2. Three point problem
3. Setting out of Simple curve using Theodolite

Total Station Survey, GPS survey & Data processing

Class Test

Note:--University examination only for survey using theodolite

Examination: 100 marks  Duration: 3 Hours

08.508  CONCRETE LABORATORY

Tests on cement
- Standard consistency of cement
- Initial and final setting time of cement
- Compressive strength of cement
- Fineness of cement (Air permeability test - Demonstration only)

Tests on aggregates (Fine aggregate & coarse aggregate)
- Particle size distribution and grading
- Fineness modulus, bulk density, void ratio and porosity
- Bulking of fine aggregate
- Specific gravity of aggregate

Tests on fresh concrete
- Slump test
- Compaction factor test
- Vee-bee test (Demonstration only)
- Flow test (Demonstration only)

Tests on hardened concrete
- Compressive strength of concrete
- Modulus of elasticity of concrete
- Flexural and split tensile strength of concrete
- Rebound hammer test

Tests on bricks and tiles
- Compressive strength of burnt bricks
- Water absorption tests on bricks
- Transverse strength test on tiles (M P tiles and mosaic tiles)

Examination: 100 marks  Duration: 3 Hours
Syllabus for VI Semester

08. 601  DESIGN OF STEEL STRUCTURES

Module  I
Properties of structural steel, Structural steel sections, Limit state and working stress design concepts, Types of connections - Design of welded and bolted connections, Design of tension members and compression members, Design of laterally supported and unsupported beams - Built up beams, Simple beam to column connections.

Module II
Plate girders- design of section, curtailment of flange plate, bearing and intermediate stiffeners, connections, flange and web splices, Gantry girders (only design concept). Columns- Design of axially and eccentrically loaded compression members, simple and built up sections, lacing and battenning, Column bases- slab bases and gusseted bases.

Module III
Light gauge steel structures – Types of sections, Flat width ratio, Buckling of thin elements, Effective design width, Form factor, Design of tension, compression members and beams. Plastic design- basic assumptions - shape factor, load factor- Redistribution of moments - upper bound lower bound and uniqueness theorems- analysis of simple and continuous beams, two span continuous beams and simple frames by plastic theory - static and kinematic methods.

References:
1. Subramanian N., Design of steel structures, Oxford University Press
2. Arya A.S. and J. L. Ajmani, Design of Steel Structures, Nemchand & Bros
3. Dayaratnam P., Design of Steel Structures, Wheeler
4. Ramachandra, Design of Steel Structures, Standard books
5. Duggal S.K., Design of Steel Structures, T.M.H. Publications

Question Paper:
Duration: 3 hours
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question of 20 marks from each module.
Use of IS. Codes: 800-2007, 811-1987, 801- 1975 and Structural Steel Tables is permitted in the Examination Hall.

Note: No other charts, tables, codes are permitted in the Examination hall. If necessary relevant data shall be given along with the question paper by the question paper setter.
Module I

Soil formation - Major soil deposits of India - Basic soil properties - Weight-volume relationships - Void ratio, porosity, degree of saturation, air content, percentage air voids, moisture content, specific gravity, bulk, saturated and submerged unit weights - Relationship between basic soil properties


Compaction of soils - Standard Proctor, Modified Proctor, I.S. light & Heavy Compaction Tests – OMC - Zero Air voids line - Control of compaction - Field methods of compaction[Brief discussion only].

Module II

Permeability of soils - Darcy’s law – Factors affecting permeability - Constant head and falling head permeability tests - Average permeability of stratified deposits


Compressibility and Consolidation - Void ratio versus pressure relationship - Coefficient of compressibility and volume compressibility – Compression index - Change in void ratio method - Height of solids method - Normally consolidated, under consolidated and over consolidated states - Estimation of pre consolidation pressure - Estimation of magnitude of settlement of normally consolidated clays – Terzaghi’s theory of one-dimensional consolidation(no derivation required) - average degree of consolidation – Time factor - Coefficient of consolidation - Square root of time & logarithm of time fitting methods-

Module III

Shear strength of soils - Mohr’s circle - Mohr-Coulomb failure criterion - Direct shear test, triaxial compression test, vane shear test, unconfined compression test - Merits and drawbacks of the tests - UU and CD tests[Brief discussion only] - Sensitivity - Thixotropy - Liquefaction - Critical void ratio

Stability of finite slopes - Toe failure, base failure, slip failure - Swedish Circle Method – Friction circle method – Factor of safety with respect to cohesion and angle of internal friction - Stability number - Stability charts - Methods to improve slope stability

References:

Question Paper:
Duration: 3 hours

The question paper consists of Part A and Part B.

Part A carries 40 marks. There will be 8 compulsory short answer questions covering entire syllabus.

Part B is for 60 marks. There will be 2 questions from each module. The candidate has to answer one question of 20 marks from each module.

Note: No other charts, tables, codes are permitted in the Examination hall. If necessary relevant data shall be given along with the question paper by the question paper setter
WATER RESOURCES ENGINEERING

Module I

Hydrology-Hydrologic cycle - Precipitation types, forms, measurements-Computation of mean precipitation- rain gauge density and optimum number of rain gauges-water losses-Infiltration-measurement by double ring infiltrometer- Horton’s equation- infiltration indices. Evaporation-measurement by IMD Land pan. Runoff-Computation of runoff by different methods. Hydrograph (Sherman), Unit hydrograph and its applications-S-hydrograph.

Module II

Planning of irrigation schemes-types of irrigation-lift and flow irrigation-Mode of irrigation water application-duty of water-soil water plant relationships-consumptive use (methods of estimation not required).-depth and frequency of irrigation water application-irrigation efficiencies.

Irrigation canals-types-canal alignment- Typical cross sections of unlined canals-Balancing depth.

Design of canals on alluvial soils based on Kennedy’s theory (no numerical problems) and Lacey’s silt theory-

canal lining-design of lined canals-Economics of canal lining-

Stream flow measurement- velocity measurements-Computation of discharge(Area-velocity method)-rating curve (stage-discharge curve).

Module III

Groundwater –vertical distribution of groundwater-Types of aquifer-Aquifer properties- Darcy’s law-Steady radial flow to a well-unconfined and confined aquifers-Types of wells-open well, artesian well and tube well-

Estimation of yield of an open well-Types of tube wells (only description, no design)

River Engineering-meadering-river training –objectives, classification, river training methods-levees, guide banks, groynes, artificial cut-offs, pitching, pitched islands (Design not necessary).

Reservoir-various types-zones of storage-storage capacity and yield-analytical and mass curve method-reservoir sedimentation-control of sedimentation-useful life of reservoir.-computation.

References:

Question Paper:
Duration: 3 Hrs.
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions covering the entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question from each module.

Note: No charts, tables, codes are permitted in the Examination hall. If necessary the same shall be given along with the question paper by the question paper setter.
HIGHWAY ENGINEERING

Module I

Introduction - Historical Development of Roads - Development of Roads in India, Classification of roads.
Highway Alignment: Requirements of highway alignment - factors controlling alignment. Engineering surveys for highway location, preparation of project reports. Highway aesthetics.
Geometric Design: Design controls and criteria, design speed, camber, sight distance, super elevation, widening of pavements on curves, horizontal curves, transition curve, gradient - vertical curves

Module II

Highway materials - Desirable properties of aggregates and bitumen - Tests on aggregate and bitumen
Pavement Design - types of pavement structures, Design of flexible pavements, CBR method only. Westergaard’s analysis of wheel load stresses and temperature stresses in rigid pavements.
Construction - WBM, Bituminous concrete and cement concrete roads.
Failures in flexible and rigid pavements - causes of failures - Maintenance of bituminous and cement concrete pavements.
Highway drainage - Importance, surface and sub surface drainage systems

AIRPORTS

Module III

Planning and Design of Airports - Aircraft characteristics which affect planning and design of airports - Airport site selection
Imaginary Surfaces - Approach zone, Clear Zone, and Turning zone.
Runway Design - Orientation, Wind rose diagram - Basic runway length computation, correction due to elevation, Temperature and gradient, runway geometric design features, Taxiway design requirements Terminal building, facilities required in a terminal building.
Apron: Size and gate positions - parking configurations, parking system.
Typical airport layouts -Runway configurations.
Airport Landing Aids - Airport markings - Airport lighting - Air traffic control aids - landing Aids - ILS.

References:
5. Horonjeff, R & Francis, M., Planning and Design of Airports, Mc-Graw Hill

Question Paper:
Duration: 3 hours
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question of 20 marks from each module.

Note: No charts, tables, codes are permitted in the Examination hall. If necessary relevant data shall be given along with the question paper by the question paper setter.
Module I
C++ programming language – Character set, tokens, data types, variables, operators, expressions, Input & Output, Selection statements – if, switch statements, Looping statements - for, while, do-while statements, Jump statements – break, continue, goto exit(), Arrays - single and multi-dimensional arrays, initializing array elements, Functions – Arguments, returning function results, call by value, call by reference, functions calling functions, functions and arrays - Global variables, automatic, static and register variables, pointers & arrays, recursive functions, function overloading.

Module II
Character arrays, Unformatted console I/O functions, Unformatted Stream I/O functions, string functions.
Structures - functions and structures - Arrays of structures - structures within structures, Structures containing arrays
Files - Input & Output, sequential & random access
Basic concepts of object oriented programming, advantages of object oriented programming, Implementation of object oriented programming concepts in C++, Definition of a class, members of a class, data members and member functions, Declaration of objects, array of objects, Constructors and Destructors, Inheritance.

Module III
Roots of transcendental equations - Successive approximations, Regular - falsi, Newton Raphson Methods, Functional approximation - Fitting straight line & parabola, Numerical Integration - Trapezoidal, Simpson’s rule & Gauss quadrature. Solution of simultaneous linear equations – Gauss elimination method, Gauss - Siedel Iteration method
Note: Programs & Numerical Problems may be included in the question paper.

References:
4. Programming with ANSI & TurboC- Kamthane, Pearson Education
5. C++ Programming - Robert Lafore, Sams publishers
6. Programming in C++ - Maria Lithian
7. Introduction to Computers - Jose S
8. Applied Numerical Analysis- Gerald, Pearson Education
9. Object Oriented programming with ANSI & TURBO C++ - Kamthane, Pearson Education
10. Object Oriented programming with C++ - . Balaguruswamy, Tata Mcgraw Hill

Question Paper: Duration: 3 hours
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions covering entire syllabus.
Part B is for 60 marks. There will two questions from each module. The candidate has to answer one question of 20 marks from each module.

Note: No charts, tables, codes are permitted in the Examination hall .If necessary relevant data shall be given along with the question paper by the question paper setter.
Module I
Objectives of soil exploration – Planning of a sub-surface exploration programme – Collection of existing information – Reconnaissance – Detailed investigation - Number, size, spacing and depth of boreholes – Different methods of exploration - Open pits and borings – Methods of boring – Auger boring, auger and shell boring, wash boring, percussion drilling, rotary drilling – Comparison of the methods

Module II
Sounding methods – Standard Penetration Test – Procedure – Various corrections to be applied to observed N values – Factors influencing the SPT results and precautions to obtain reliable results – Merits/drawbacks of the test – Correlations of N value with various engineering and index properties of soils
Static Cone Penetration Test – Procedure – Merits/drawbacks – Correlation of static CPT results with various soil properties - Dynamic Cone Penetration Test – Procedure – Merits/drawbacks – Critical comparison of SPT, static CPT and dynamic CPT
Plate load test – Procedure, uses and limitations - Pressure meter test - Procedure - Uses

Module III
Soil sampling – Undisturbed, disturbed, and representative samples – Chunk and tube samples – Factors affecting sample disturbance and methods to minimize them – Area ratio – Inside clearance – Outside clearance – Recovery ratio – Ball check valve – Handling and transportation of samples – Extrusion of samples

References:

Question Paper:
Duration:3 hours
The question paper consists of Part A and Part B.
Part A carries 40 marks. There will be 8 compulsory short answer questions covering entire syllabus.
Part B is for 60 marks. There will be 2 questions from each module. The candidate has to answer one question of 20 marks from each module.
Module I
Definition-Sources- Categories of wastes-Municipal, Industrial, Medical, Universal, Construction and demolition debris, Radioactive, Mining, Agricultural waste Generation rate- Measure of quantities, methods used to generation rate. Composition- Physical and chemical (simple problems). storage of solid waste- Container location.

Module II

Module III

References;

Question paper:
Duration : 3 Hrs
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering entire syllabus.
Part B is for 60 marks. There will be 2 questions form each module. The candidate has to answer one question from each module.

Note: No charts, tables, codes are permitted in the Examination hall .If necessary the same shall be given along with the question paper by the question paper setter.
Module I
Review of fundamental principles and its relative significance – (no questions to be asked). Classification of ocean waves, Definition of wave parameters (wave length, period, Celerity). Regular and irregular waves. Linear Wave theory (Airy’s theory)-Assumptions- Boundary Conditions, solution of Laplace equation with Boundary Conditions - Derivation of wave surface profile, wave length, wave celerity, orbital motion of water particles and orbital displacement of water particles in shallow water condition, transitional water condition and deep water conditions-related problems.

Module II
Wave kinematics, pressure field under wave system, wave energy, Energy propagation (Energy flux or wave power), group velocity in deep and shallow water conditions-related problems. Wave Transformations- Shoaling, refraction – refraction patterns on different bed configurations- problems considering shoaling and refraction effects, wave reflection wave diffraction, wave breaking in deep water, transitional water and shallow water, types of breakers.

Module III

References:
2. Robert G. Dean & Darlymole, Water wave mechanics for engineers and scientists, Prentice Hall Publishers-New Jersey
5. Robert M Sorenson, Basic Coastal Engineering, Springer,2005
6. Harbour and Coastal Engineering-NIOT Chennai

Question Paper:
Duration: 3 hours

The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question of 20 marks from each module.

Note: No charts, tables, codes are permitted in the Examination hall .If necessary the same shall be given along with the question paper by the question paper setter
Module I
Errors in numerical computation – System of linear algebraic equations – factorization methods – Multiple right hand sides - Ill-conditioned systems – Symmetric and Banded systems .
System of non linear equations – Newton-Raphson Method.

Module II
Lagrangean and Hermitian interpolation – Quadratic splines - cubic splines (Examples with equal intervals only) - Data smoothing by least squares criterion – Parabolic and non-polynomial models like exponential model and power equation – Multiple linear regression.

Higher-order equations of initial value type. by Runge-Kutta method.

Module III
Ordinary differential equations of the boundary value type – Finite difference solution.
Elliptic equations – Finite difference method – Problems with irregular boundaries.

Note: Importance must be given to structural engineering problems wherever possible.
Assignments must be computer oriented.

References :
7. B.S Grewal, Numerical methods for Engineers & scientists, Khanna Publishers

Question paper:
Duration: 3 Hrs.
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering the entire syllabus .
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question from each module.
Module I

Traffic Engineering: Definition, Functions.
Road User, Vehicle and The Road: Human factors governing road user behaviour - Vehicular characteristics.
Origin-Destination Surveys- methods, zoning and presentation of results.

Module II

Traffic Controls: Different types of traffic signs and markings. Traffic signals - design, coordinated signals-time-distance diagram -area traffic control-Other traffic control aids and street furniture.
Intersections And Interchanges –Types-Planning and layout
Parking: Zoning and parking space requirements-On street and off street parking.
Traffic Management-Concept and techniques.
ITS, GIS And GPS- Introduction to Intelligent Transportation Systems, Geographic Information System and Global Positioning System
Street Lighting- Necessity, methods, arrangement- at carriageways, T, rotary, bend, bridge, tunnels.

Module III

Highway Capacity And Level Of Service: Definitions - PCU-LOS concept, Factors affecting capacity and LOS. Capacity of highways, urban streets, rotary, weaving sections and intersections.
Theory Of Traffic Flow: Fundamental diagram of traffic flow-Relationship among the variables.

Reference:
7. Guidelines for capacity of roads in rural areas -IRC 64-1990
8. Traffic studies for planning By-passes around towns -IRC 102-1988
10. Guidelines for design and installation of Road Traffic Signals -IRC 93- 1985

Question paper:
Duration: 3 Hrs.
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering the entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question from each module.

Note: No charts, tables, codes are permitted in the Examination hall .If necessary relevant data shall be given along with the question paper by the question paper setter.
Module I
Basic principles of valuation- Cost price and value- kinds of properties-Different purposes of valuation- kinds of values and definition-Factors affecting the value in general-Sources of valuation-Procedure to become a valuer-Report writing.
Different methods of Valuation- Valuation by land and building method- Valuation of flats- Composite rate method- Valuation of commercial complex-Rent capitalization method.

Module II
Valuation of land-Market value-Guideline value-FSI and plot coverage- Land locked land-Recess land-Valuation by belting method-Land measurement units- case studies.
Depreciation –Types, Methods of calculating depreciation- Obsolescence- Valuation of buildings-Replacement value- Depreciation value- case studies.

Module III
Valuation for banks- Different purposes-Collateral security and primary security- Valuation formats- Legal aspects of valuation.
Valuation for taxation-Income tax, wealth tax, capital gain-Probate.

Reference:
1 S.C Rangwala, ‘ Valuation of Real properties’, Charotar publishing House Pvt.Ltd.
2 Chakrabarthi.M, ‘Estimating costing and specifications in Civil Engineering, USB publishers and distributors Ltd.New Delhi
3 Duglas Scarett, ‘Property valuation-The 5 methods, Spon press,Taylor and Francis
5 Roshan H Namavati,’Theory and practice of valuation’Lakhani Book Depot,Bombay
6 Asok Nain,’Professional Valuation Practice’Tata Mc. Graw Hill,New Delhi

Question paper:
Duration: 3 Hrs.
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering the entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question from each module.

Note: No charts, tables, codes are permitted in the Examination hall .If necessary relevant data shall be given along with the question paper by the question paper setter.
Module I
Concepts of sustainability: Energy and Global environment, Energy use and Climate change – Its impact, Types of Energy systems, Concept of Sustainability - Principles of conservation -synergy with nature, Bioregionalism - community basis shelter technology within bioregional patterns and scales, Ethical-environmental degradation.

Module II
Sustainable Building Materials and Construction: Properties, Uses and Examples of -Primary, secondary and Tertiary Sustainable Materials, Principles to improve the energy efficiency - siting and vernacular design, shade, ventilation, earth, shelter, thermal inertia and air lock entrances. Techniques of sustainable construction -technologies, methods of effectiveness, and design synthesis – Green buildings - alternative materials and construction methods: solar water heating panels; photovoltaic electricity generation; use of local materials and on site growth of food, fuel and building materials.

Module III

References:
1) B.C.Bose, “Integrated approach to sustainable Development”, Rajat Publications, Delhi
2) Laurie Baker’s, “Chamoli Earthquake hand book”, Costford, Centre of science and technology for rural development.

Question paper:
Duration: 3 Hrs.
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering the entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question from each module.
Module I

Module II

Module III
Floods and their estimation- definition, causes, design flood, chance flood, estimation of design flood, and flood frequency- empirical formula such as Dicken’s, Ryves- statistical method – California method- Gumbel’s method
Flood routing-Hydraulic and hydrologic routing (concepts only)-reservoir routing- I-S-D method -channel routing- Muskingum method.
Flood control methods- Flood control reservoirs- retarding basins – construction of levees- channel improvement- soil conservation method- flood forecasting and warning.

Reference:
6. B. C. Punmia,’’Irrigation and Power Engineering’’, Laxmi publications (P) Ltd

Question Paper:
Duration: 3 hours
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question of 20 marks from each module.

Note: No charts, tables, codes are permitted in the Examination hall .If necessary the same shall be given along with the question paper by the question paper setter.
Module I
Definition of Nanoscience and Nanotechnology - Historical development of nanotechnology - Nano and nature-Nanoscale investigation methods:
Scanning Probe Microscopies-Scanning Tunneling Microscopy, Atomic Force Microscopy and Scanning Probe Lithography.
Optical Microscopies-Confocal Microscopy and Scanning Nearfield Optical Microscopy.

Module II
Photoelectron Spectroscopy and X-Ray Diffraction methods-
Nanomaterials: Synthesis, properties and uses of Fullerenes, Carbon Nanotubes, Semiconductor Quantum Dots, Core-shell Nanoparticles and Nanoshells - Nanomanufacturing: Bottom Up and Top Down methods

Module III
Nanointerfaces: Nanosensors, Molecular Nanomachines and Nanotribology-
Nanotechnology in Construction- Nanotechnology in Aerospace-Nanotechnology and Environment-Nanotechnology in Water treatment and Air purification-
Societal Implications of Nanoscience and Nanotechnology- Basic concepts of Nanoethics and Nanoeconomics-Nanotechnology in Development- Health effects of Nanoparticles.

References:

Question Paper:
Duration: 3 hours
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question of 20 marks from each module.
Module I

Module II
Preparedness and mitigation measures for earthquakes, floods, tsunamis, landslides and volcanoes with special reference to construction of residential buildings and public utility buildings. Disaster mitigation planning of human settlements and townships for earthquakes, floods, tsunamis, landslides and volcanoes.

Module III
Issues in the prediction of natural disasters, land use practices and disaster mitigation. Integration of rural development programmes with natural disaster mitigation and planning. Information systems and decision making tools in disaster management. Disaster management in India.

References

Question paper:
Duration: 3 Hrs
The Question paper consists of Part A and Part B.
Part A carries 8 compulsory questions (short answer questions) covering the entire syllabus and is for 40 marks.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question out of two.
Note: No charts, tables, codes are permitted in the Examination hall. If necessary relevant data shall be given along with the question paper by the question paper setter.
Module-I

Listening, Reading, Speaking and Writing skills.

Listening Skills: Listening for general content- Intensive listening-Listening for specific information.
Speaking Skills: Oral practice-Describing objects/situations/people-Role play-Just A Minute/Group Discussion-
informal letters-essentials of telephonic conversation-invitations-minutes of a meeting.
Reading Skills: Skimming the text- exposure to a variety of technical articles, essays, graphic representation,
and journalistic articles.
Writing Skills: Skills to express ideas in sentences, use of appropriate vocabulary -sentence construction-
paragraphs development-note making-editing a passage and essay writing.

Basics of Technical Communication.

Technical communication- features, Distinction between general and technical communication- language as a
tool of communication- levels of communication-interpersonal, organizational, mass communication-the flow of
communication: upward, downward and lateral-importance of technical communication- barriers to
communication.

Module-II

Forms of Technical communication.
Business letters-sales and credit letters, letter of enquiry, letter of quotation, placing order. Job application and
resume. Official letters-govt. letters, letter to authorities. Reports-types, significance, structure and style, writing
reports, condensing .Technical proposals-writing a proposal –the steps involved. Technical papers- projects-

Module III

A non-detailed study of the autobiography: “Wings of Fire-an autobiography by APJ Abdul Kalam”.
Students should read the book on their own and selected topics may be discussed in the class.

References.

4. Everyday Dialogues in English-Robert J Dixson, PHI.

University Examination:
Six short questions to be answered out of 8 questions from Module I. Each answer carries 5 marks. (30 marks).
Questions to be limited to the topics Writing Skills& Basics of Technical Communication. 2 questions out of 4
has to be answered from Module II. Each answer carries 15 marks. (30 marks).Two essays out of Four has to be
answered from module III.. Each answer carries 20 marks. (40 marks).
1. Tests on Aggregates
   (i) Crushing Value
   (ii) Los-Angeles Abrasion Value
   (iii) Impact Value
   (iv) Specific Gravity
   (v) Water Absorption
   (vi) Shape Test – Flakiness Index, Elongation Index & Angularity Number

2. Tests on Bitumen
   (vii) Viscosity Test with Brookfield viscometer
   (viii) Ductility Test
   (ix) Softening Point Test
   (x) Specific Gravity
   (xi) Flash Point Test

3. Tests on Soil
   (xii) Modified Proctor Compaction Test
   (xii) CBR Test

Reference:

Examination: Duration: 3 hrs. Max.Marks – 100
1. Preparation of Civil Engineering Drawings – plan, section and elevation of buildings.

2. Application of spreadsheets in Civil Engineering:
   (i) BM and SF diagrams of cantilever, simply supported and overhanging beams.
   (ii) Analysis of continuous beams by moment distribution method.
   (iii) Design of singly/doubly reinforced sections by limit state method.

3. Use of structural analysis software for analysis of simple two dimensional structures like continuous beam, portal frame and plane truss. (Not to be included for examination)

4. Application of GIS in Civil Engineering – preparation of database and GIS analysis. (Not to be included for examination)

Any standard software packages can be used for drafting, spreadsheet, structural analysis and GIS.

References:
The manuals of the software packages used.

Examination: - Duration: - 3 hrs. Max.Marks-100

Question for examination:
Question on Civil Engineering Drawing is compulsory.
One full question on CAD drawing or a CAD drawing (simple figures) and a Spread sheet analysis may be asked.
In Evaluation 50% credit may be given to the output.

Note:- The printouts of the drawings and spreadsheets should be attached in the lab record maintained by the students.
**Syllabus for VII Semester**

**08.701  ADVANCED STRUCTURAL ANALYSIS**

**Module I**
Introduction to matrix analysis of structures – Concept of flexibility and stiffness influence coefficients – Concept of development of flexibility matrix by physical approach – Equivalent joint loads – Concept of element approach – Development of equilibrium matrix – Element flexibility matrices for truss, beam and plane frame elements - Development of structure flexibility matrix by element approach – Evaluation of displacements in statically determinate beams, rigid jointed and pin-jointed plane frames by flexibility matrix approach – Analysis of statically indeterminate beams, rigid jointed and pin-jointed plane frames by flexibility matrix approach.

**Module II**
Concept of development of stiffness matrix by physical approach – Concept of element approach – Development of compatibility matrix – Element stiffness matrices for truss, beam and plane frame elements - Development of structure stiffness matrix by element approach– Analysis of statically indeterminate beams, rigid jointed and pin-jointed plane frames by stiffness matrix approach – Concept of direct stiffness method – Transformation of element stiffness matrices from local to global co-ordinates – Application of direct stiffness method to two span continuous beams- Advantages of direct stiffness method – Comparison of flexibility matrix and stiffness matrix methods.

**Module III**

**References**

**Question Paper: Duration:3 hours**
The question paper consists of Part A and Part B.
Part A carries 40 marks. There will be 8 compulsory short answer questions covering entire syllabus.
Part B is for 60 marks. There will be 2 questions from each module. The candidate has to answer one question of 20 marks from each module.
Module I
Dams-Gravity dams, arch dams, buttress dam, forces acting on dam-theoretical and practical profiles of gravity dam-low dam, high dam-stability of dam-stress in elementary profile of gravity dam. Function of shafts, galleries, keys and water seal.
Arch dams-types, forces acting-design methods (Thin cylinder theory only)-Earth dam-Types-criteria for safe design-causes of failure. Spillways-Different types (Design not necessary).

Module II
Diversion head works, layout, functions of components-cause of failure of weirs on permeable soils- Bligh’s theory-design of vertical weir-Khosla’s theory of independent variables-use of Khosla’s charts and Blench curves.
Cross drainage works-different types-Canal falls-classification (brief description only).

Module III
Design and drawing emphasizing the hydraulic aspects of the following structures:

References:
7. Sathyanarayana Murty Challa ”Water Resources Engineering-Principles and Practice’New age international publishers.

Question paper:Duration: 4 hrs
The question paper consists of Part A, Part B and Part C
Part A(Compulsory) is for 20 marks(4x5) covering the entire syllabus
Part B is for 20 marks covering modules I and II. There will be 2 questions from each module. The candidate has to answer one question of 10 marks from each module
Part C is for 60 marks covering module III. Candidate has to answer one out of two questions from this part.
The question consists of design and drawing parts,
In the drawing part maximum of two views only be asked.
Khosla’s charts and Blench curves are permitted.

Note: No other charts, tables, codes are permitted in the Examination hall .If necessary the same shall be given along with the question paper by the question paper setter.
Module I
Stresses in soil due to loaded areas - Boussinesq’s and Westergaard’s formulae for point loads – assumptions [no derivation required] – Comments - Vertical stress beneath loaded areas of strip, rectangular and circular shapes - Newmark’s charts - Isobars - Pressure bulbs
Earth pressure – At-rest, active and passive earth pressures – Practical examples - Rankine’s and Coulomb’ methods - Comparison [no derivation required] - Influence of surcharge, inclined backfill and water table on earth pressure - Earth pressure on layered soils

Module II
Bearing capacity of shallow foundations – Ultimate, safe and allowable bearing capacity. - Terzaghi’s formula [no derivation required] for isolated strip, circular and square footings - Bearing capacity factors - Local and general shear failure - Factors affecting bearing capacity – Influence of water table
Settlement - Total and differential settlement - Causes - Methods of reducing differential settlement - Soil improvement through installation of vertical drains and preloading - Use of compaction piles
Brief introduction to site investigation – Guidelines for choosing spacing and depth of borings [brief discussion only] - Auger boring and wash boring methods - Standard Penetration Test- - Soil investigation report

Module III
Combined footings- Rectangular and Trapezoidal combined footings – Raft foundations - Allowable Bearing capacity of Rafts on sands and clays - Floating foundation.
Pile foundations - Point bearing and friction piles - Bearing capacity of single pile in clay and sand [I.S. Static formulae] - Dynamic formulae [ENR and Modified Hiley only] - I.S. Pile load test [conventional]- Negative skin friction. on a single pile - Capacity of Pile groups - Group action
Brief introduction to well foundations - Elements of a well foundation – Problems encountered in well sinking – Methods to rectify tilts and shifts - Brief introduction to Machine foundation –Mass spring model for undamped free vibrations - Natural frequency of foundation-soil system – Coefficient of uniform elastic compression – Methods of vibration isolation

References:

Question Paper: Duration: 3 hours
The question paper consists of Part A and Part B.
Part A carries 40 marks. There will be 8 compulsory short answer questions covering entire syllabus.
Part B is for 60 marks. There will be 2 questions from each module. The candidate has to answer one question of 20 marks from each module.
Module I
Introduction of environment- sources of water supply-quantification of water demand through population forecasting –Factors affecting consumption-Fluctuations in demand-Types of intakes-Conveyors, pumps and location of pumping station-Quality of water-Drinking water standards-Physical, chemical and biological analysis.

Module II
Treatment of water-Theory and principles of Sedimentation tanks-Stoke’s law-Types of settling (Type I & Type II only)-Coagulation-Mixing-Flocculation, Clariflocculator-Filtration-Types of filters-Rapid sand, Slow sand, and Pressure filters-Design of Sedimentation tanks (circular and rectangular)-Clariflocculators-Rapid sand filter-Slow sand filter

Module III

References:

Question Paper: Duration: 3hrs
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering entire syllabus.
Part B is for 60 marks. There will be 2 questions form each module. The candidate has to answer one question from each module.
Module I
Analysis of stress and strain in three dimensions –stress at a point, transformation, principal stress, surface force and body forces, equations of equilibrium. Homogeneous deformation, strain at a point, principal axes of strain, compatibility equations. Invariants of stress and strain. Equation of theory of elasticity, Generalised Hook’s law-reduction in number of elastic constants for orthotropic, transversely isotropic and isotropic media. Stress strain relations.

Module II
Two-dimensional problems in rectangular coordinates Generalized plane stress and plane strain, Basic equations, stress functions, solutions by polynomials, Bending of a cantilever loaded at free end and bending of a beam by uniform load. Solution in the form of Fourier series for a simply supported beam subjected to continuous loads.

Module III
Two-dimensional problems in polar co ordinates, Basic equations in polar co ordinates, Axi-symmetric stress distribution curved beams, thick cylinders, rotating disc. General solution bending of a curved bar by a force at the end, effect of circular holes on stress distribution in plates. Concentrated force at a point of a straight boundary, circular disc subjected to diametrical compression.
Torsion of prismatic members, circular cross section, non-circular rectangular and elliptic section, membrane analogy.

References:

Question Paper: Duration: 3 hours
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions covering entire syllabus.
Part B is for 60 marks. There will two questions from each module. The candidate has to answer one question of 20 marks from each module.
Note: No charts, tables, codes are permitted in the Examination hall. If necessary relevant data shall be given along with the question paper by the question paper setter.
Module I

Module II
Stability analysis – method of slices - pore pressure during construction, steady seepage and sudden drawdown – approximate analysis for the above conditions using Taylor’s stability charts
Embankment construction – compaction control – placement water content

Module III
Failure of earth dams – types of failure and damages – embankment compressibility and swelling – settlement of foundations – movement of crest – Adverse effects of seepage – liquefaction and its prevention - instrumentation in earth dams -
Control of seepage – cut off trenches – grout curtains – sheet pile walls – upstream blankets – relief wells

References:

Question Paper: Duration:3 hours
The question paper consists of Part A and Part B.
Part A carries 40 marks. There will be 8 compulsory short answer questions covering entire syllabus.
Part B is for 60 marks. There will be 2 questions from each module. The candidate has to answer one question of 20 marks from each module.
Module I
Classification of piles based on mechanism of load transfer, method of installation, material used – Concrete piles - Ultimate skin friction and end bearing capacity of single pile in clay and sand by the I.S.code method – Critical depth concept - Ultimate skin friction and end bearing capacity of single pile installed in granular soils based on SPT and CPT values – Basis of dynamic formulae - The rational pile formula – Modified Hiley formula – General comments on the reliability of dynamic formulae - Pile driving stresses - Conventional and cyclic pile load tests – Piles for resisting uplift - Tension piles of uniform diameter in clays and sands - Tension piles with enlarged base in clays.

Module II
Single pile versus pile groups – Pile group configurations - Group action – Efficiency of pile groups - Group capacity – Minimum spacing of piles in a group – Negative skin friction of pile groups – Settlement of pile groups in clays – Equivalent raft approach - Settlement of pile groups in sands - Skempton’s and Meyerhof’s methods - Brief discussion on drilled piers.

Module III

References:

Question Paper: Duration: 3 hours

The question paper consists of Part A and Part B.
Part A carries 40 marks. There will be 8 compulsory short answer questions covering entire syllabus.
Part B is for 60 marks. There will be 2 questions from each module. The candidate has to answer one question of 20 marks from each module.
08.705.4 Elective-III STRUCTURAL ANALYSIS FOR DYNAMIC LOADS

Review: Dynamic Systems - parameters, Single degree of freedom (SDOF) systems, Equation of motion, Natural frequency, Free and forced vibration.

Module I
SDOF system subjected to harmonic loading - steady state amplitude, Dynamic magnification factor, Resonance. Impulse response function, Response of SDOF system subjected to general dynamic loading – Duhamel integral, Response of SDOF system to rectangular and triangular loads. SDOF system subjected to support motion, Vibration isolation, Transmissibility.

Module II
Multi-degree of freedom (MDOF) systems, Lumped mass systems, Shear building frames, Equation of motion of MDOF systems, Natural frequencies and mode shapes, Orthogonality of mode shapes, Free and forced vibration analysis - Mode superposition method.

Module II

References:

Question Paper: Duration: 3 hours
The Question paper contains Part A and Part B.
Part A carries 8 compulsory questions (short answer questions) covering the entire syllabus and is for 40 marks. Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question out of two.

Note: IS:1893-2002 is permitted in the examination hall. No others charts, tables and codes are permitted. If necessary relevant data shall be given along with the question paper by the question paper setter.
Module I
Wind and its characteristics—nature of winds—types of winds—Extreme wind conditions—aerodynamics of civil Engineering structures.
Characteristics of wind—gradient wind speed—maximum Windspeed, mean wind speed, wind as a random process

Module II
Static wind effects—drag coefficient, lift coefficient.
Dynamic wind effects—along wind load—across wind load, flutter, galloping, buffeting, other wind effects
Various national codes on wind engineering—comparison.

Module III
Examples on wind load calculations as per IS 875 (part 3)—wind load calculation on special structures such as cooling towers, rail/roadsbridges and tall chimneys

References
2. IS 875 (Part 3)
3. Other relevant IS codes

Question Paper: Duration: 3 hours
The question paper consists of Part A and Part B.
Part A carries 40 marks. There will be 8 compulsory short answer questions covering entire syllabus.
Part B is for 60 marks. There will be 2 questions from each module. The candidate has to answer one question of 20 marks from each module.
Use of IS 875 (Part 3) is permitted in the examination hall.
Module I
Introduction- Components of Environment- Definition –Air Pollution- Scales of air pollutant measurement - Sources of Air pollution – Definition- Air Pollutant- Types of Air Pollutant- Industrial Processes causing Air Pollution - Effect of air pollutants on health, vegetation, animals and materials - Indoor Air Pollution (Definition )

Module II
Meteorological aspects of Air Pollutant Dispersion - Temperature and Pressure relationships-Atmospheric Stability- Temperature Lapse Rate- Inversions- Effect of Wind velocity and turbulence-Plume behaviour Dispersion of Air pollutants-Plume dispersion theory- Gaussian plume model (Derivation not required)- Assumptions-Advantages and Disadvantages- Pasquill's stability curves - -Application of specific dispersion problems involving point source and line source - Estimation of plume rise.

Module III
Air Quality monitoring - Ambient air sampling - Collection of gaseous air pollutants-Collection of particulate Pollutants- Ambient Air Quality standards- Control of Air Pollutants- Particulate emission control-Scrubbing- Cyclones- Filtration- Electrostatic Precipitation-Gaseous emission control- Adsorption- Absorption- Condensation -Air pollution disasters

References:
3. C.S.Rao, “Environmental Pollution Control Engineering” Wiley Eastern Ltd, Delhi

Question paper : Duration : 3 Hrs
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering entire syllabus.
Part B is for 60 marks. There will be 2 questions form each module. The candidate has to answer one question from each module
Note: No charts, tables, codes are permitted in the Examination hall .If necessary the same shall be given along with the question paper by the question paper setter.
Module I
Definition of management – managerial functions – inter relationship between managerial functions - managerial skills – roles of managers.
Personnel management in organizations – definition – functions - role and functions of personnel manager
Staffing process – recruitment and selection – induction and placement – training and development.

Module II
Work and productivity analysis – factors influencing productivity – benefits from increased productivity – data gathering for on-site productivity-improvement studies – questionnaires, interviews, activity sampling, recording of work-face practices like still photographs, time studies, video techniques – presenting and implementing productivity-improvement findings – crew balance charts, flow diagram, process charts.
Performance rating – allowances.

Module III
Behavioural science aspects – Motivation of individuals – definition – theories of motivation - Maslow’s theory – Herzberg’s model – McClelland’s three need model – Vroom’s expectancy theory – McGregor’s theory.
Communication – importance and process – directions of communication – media and types of communication - factors affecting communication – barriers to communication – improving interpersonal and organizational communication.

References:
2. Productivity Improvement in Construction, Clarkson Oglesby, Henry Parker, Gregory Howell

Question paper : Duration : 3 Hrs
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering entire syllabus.
Part B is for 60 marks. There will be 2 questions form each module. The candidate has to answer one question from each module.
Note: No charts, tables, codes are permitted in the Examination hall .If necessary the same shall be given along with the question paper by the question paper setter.
Module I
Introduction to Ocean oil gas and other resources – near shore structures - Different types of ocean structures and systems - Gravity, fixed, floating semi submersibles, compliant structure-Tension legged platform and guyed tower. Design of fixed offshore Jacket Platform-Steps in design. Environmental load calculation (wind, wave, current and tidal) and design parameters. Problems on checking the sufficiency of tubular members under different loading conditions in conformity with the API-Code. Tubular Joints-different types. Analysis of Joints, Stress concentration factor, fatigue failure-SN curves

Module II
Basic principles of design of concrete offshore platforms - Jack up platforms, Wave forces on large structures-Froude-Krylov Forces-General theory. Design of compliant structures forces & bending moments in floating platforms Design principles of - Tension leg platform Sizing and mechanics –weight estimate of TLP.

Module III
Mechanics of mooring lines-steady state forces in mooring line due to current. Equation of static equilibrium. Integration of equilibrium equations –heavy and short cables-neutrally buoyant cables, Profile of cable line under all forces considered- Critical angle.

References:

Question paper:Duration: 3 Hrs.
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5marks each covering the entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question from each module.
Note: No charts, tables, codes are permitted in the Examination hall .If necessary the same shall be given along with the question paper by the question paper setter.
Module-I
Urban hydrology – urban flooding-causes of flooding-remedial measures-Design of urban storm water collection system-Gutters, inlets and sewers-rational formula-limitations-Storm water pollution and control (basic concepts)-Best management practices for urban drainage-constructed treatment wetlands (No design).

Module – II

Module-III
Contaminant propagation through soil-different mechanisms-hydraulic aspects of pollutant transport (basic ideas only)-introductory knowledge about groundwater contamination-sources and remedies. Brief discussion on environmental impacts of different types of water resources projects such as irrigation, flood control, dams. Environmental impact assessment-Onsite and offsite impacts-Matrix, networks and other techniques-index methods for environmental impacts on groundwater – simple quantitative approaches for watershed impacts-soil loss equation.

References:

Question Paper: Duration: 3 hours
The question paper consists of Part A and Part B.
Part A carries 40 marks. There will be 8 compulsory short answer questions covering entire syllabus.
Part B is for 60 marks. There will be 2 questions from each module. The candidate has to answer one question of 20 marks from each module.
Module I
Introduction to basic concepts and principles of prestressing systems – Introduction to the IS code- losses in prestress- Limit state of collapse and serviceability, comparison of IS codes with other codes.
Analysis and design of prestressed concrete slabs, economic span, load balancing, serviceability requirement, deflection and cracking

Module II
Analysis and design of statically indeterminate structures – Simple cases of cantilever beams and slabs- Concordancy and linear transformation – continuous beams and portal frames
Composite construction - Elementary idea – analysis of sections – effect of shrinkage strain in composite sections.

Module III

References:
1. IS 1343: 1980 Code of practice for Prestrssed Concrete
2. IS 456 : 2000 Code of practice for Plain and Reinforced Concrete

Question paper:Duration : 3hrs
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering the entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question from each module. Use of IS 1343: 1980 and IS 456:2000 is permitted.
Note: No charts, tables or other codes are permitted in the examination hall. If necessary, relevant data shall be given along with the question paper by the question paper setter.
Module - I

Properties of component layers; different types and role played by them in flexible/rigid pavement. Mechanical response of soil and the different constitutive models, different laboratory procedures for evaluating the mechanical properties of soils. Road making aggregates - classification, properties of aggregates, design of aggregate gradation.

Module - II

Bituminous road binders - penetration grading, viscosity grading, emulsions, cut backs and modified binders. Rheology of bituminous binders, modified binders, aging of bitumen.

Bituminous mixtures, Mix design- Marshall method and Superpave procedure, Design of emulsified mixes, requirements, properties, tests for characterization, Influence of aggregate, binder type on bituminous mixtures, mechanical properties.

Issues in constitutive modelling of binders, Introduction to linearized viscoelastic behaviour, behaviour during fatigue, creep loading conditions, resilient modulus of pavement materials.

Module -III


References:


Question paper: Duration: 3hrs

The question paper consists of Part A and Part B.

Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering the entire syllabus.

Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question from each module. Use of IS 1343: 1980 and IS 456:2000 is permitted.

Note: No charts, tables or other codes are permitted in the examination hall. If necessary, relevant data shall be given along with the question paper by the question paper setter.
Module I

Module II

Module III
Computer Vision – Different levels of vision processing – Low level processing edge deletion line filling – depth & Orientation information – Object recognition – Practical vision system.

References:
1 Alison Cawsey, The Essence of Artificial Intelligence, Prentice Hall Europe , 1998
4 Artificial Intelligence, Winston
5 Principles of Artificial Intelligence, Nilsson, Narosa, 1998
6 Artificial Intelligence, Eliane Rich, MCH
7 Artificial Intelligence an Engineering Approach, Robert J. Schalkoff, MCH

Question Paper: Duration: 3 hours
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question of 20 marks from each module.
Note: No charts, tables, codes are permitted in the Examination hall. If necessary relevant data shall be given along with the question paper by the question paper setter.
Analysis of water for any eight of the following:
1. Acidity
2. Alkalinity
3. Hardness
4. Solids
5. Dissolved Oxygen
6. Sulphates and Sulphides
7. Iron
8. Jar Test
9. Residual Chlorine
10. Nitrates
11. Chlorides

Examination: Duration: 3 Hrs.  Max.marks: 100

List of Experiments
1. Specific Gravity Test
2. Field Density Test
3. Sieve Analysis
4. Hydrometer Analysis
5. Atterberg Limits Test
6. Permeability Test
7. Unconfined Compression Test
8. Direct Shear Test
9. Consolidation Test
10. Compaction Test

Examination: Duration - 3 hours  Max. Marks - 100
08.708  (a) Seminar & Project

(b) Survey camp & Industrial Training

Survey Camp should be completed before the commencement of 7th semester. The minimum duration of the survey camp should be one week. The use of total station is compulsory for survey work. Total 100 marks for 08.708 can be distributed as 40+10+30+20 for seminar, preliminary work for the 8th semester project, survey camp and industrial training respectively.

Students have to visit at least one industry relevant to civil engineering as part of industrial training and spend a minimum of one week to understand the processes/activities. A report of the same should be submitted at the end of 7th semester and evaluation should be based on this report.
Syllabus for VIII Semester

08.801 DESIGN AND DRAWING OF REINFORCED CONCRETE STRUCTURES

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Module I

Design of retaining walls – Limit State method - cantilever and counterfort retaining walls with horizontal and inclined surcharge.

Water tanks – design of circular, square and rectangular water tanks at ground level and overhead, complete design excluding supporting structure – design of domes for circular water tanks.

Drawing and detailing of structures designed.

Module II

Road Bridges – IRC specifications – Class A, Class AA loading – Design of slab bridges, T-beam and slab bridges.

Flat slabs – analysis of flat slab – direct design method – principles of equivalent frame method – design of flat slabs for flexure and shear.

Drawing and detailing of structures designed.

References:

3. Ashok K Jain, ‘Reinforced Concrete Limit State Design’, Nem Chand Brothers, Roorkee
5. S.N.Sinha, Reinforced Concrete Design Tata McGraw- Hill
6. N.Krishnaraju, Prestressed Concrete Tata McGraw- Hill
8. N.Krishnaraju, Design of Bridges, Universities Press Ltd.
9. S.Ramamrutham, RCC Design
10. V.Johnson, Essentials of Bridge Engineering

Question Paper: Duration: 4 hours

The question paper consists of Part A and Part B.

Part A contains 2 compulsory questions of 10 marks each covering entire syllabus.

Part B Answer one out of two questions from each module. Each question carries 40 marks; 20 marks for design and 20 marks for drawing.

Use of IS 456:2000; 3370 (parts I- IV), IRC 6 & 21 and design charts are permitted in the examination hall.
Module I

Water tanks- Design of rectangular steel tanks- Pressed steel tanks- Cylindrical tanks with hemispherical bottom- Design of supporting towers and its foundation.

Roofs -Design of purlins and trusses for dead load, live load and wind loads- rolled steel angle and tubular sections.

Drawings of the structures designed above.

Module II

Steel chimneys-Types of chimneys, IS Specifications-Design of self supporting chimneys.

Steel bridges –Types of bridges, Railway MBG and MMG loading -Design of plate girder bridges - Truss girder bridges (only design concept) -bracings and bearings.

Drawings of the structures designed above.

References:
1. Raghupathy, Design of Steel Structures, TMH.
2. Ramachandra, Design of Steel Structures, Standard books
3. Arya A.S. and J. L. Ajmani, Design of Steel Structures, Nemchand & Bros
4. Ramamrutham S., Design of Steel and Timber Structures, Dhanapath Rai
5. Vazirani V.N. and M.M.Ratwani, Steel Structures and Timber Structures, Khanna Publishers
6. Krishna Raju N., Structural Design and Drawing, Universities Press

Question paper: Duration : 4 hrs

The question paper consists of Part A and Part B.

Part A contains 2 compulsory questions of 10 marks each covering entire syllabus.

Part B Answer one out of two questions from each module Each question carries 40 marks; 20 marks for design and 20 marks for drawing.


Note: No other charts, tables, codes are permitted in the Examination hall .If necessary relevant data shall be given along with the question paper by the question paper setter.
Module I
Waste water- Sources, Quantity-Characteristics- systems of Sewerage, Sewer appurtenances-Man holes, Catch basin, flushing devices, Inverted siphon.
Waste water disposal systems-Self purification of streams, Dilution techniques-Oxygen sag curve-Streeter Phelp’s Equation and its application-land treatment

Module II
Treatment of sewage-Preliminary-Theory and design of Screen and Grit chamber, Detritus chamber, Skimming tank. Primary treatment-Sedimentation tank, Secondary treatment-Contact bed, Intermittent sand filter, Trickling filter, Activated sludge process, Design of Trickling filter(High rate, standard),Activated sludge process- Septic tank- Imhoff tank

Module III

References:

Question Paper: Duration: 3hrs
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering entire syllabus.
Part B is for 60 marks. There will be 2 questions form each module. The candidate has to answer one question from each module.
Module I
General Introduction:-
Specifications- purposes and basic principles-general specifications.
Analysis of rates- Introduction to the use of data book and schedule of rates- cost of materials at site- cost of materials at source- conveyance charges.
Detailed specification, preparation of data and analysis of rates for various items of work connected with building construction and culverts with reference to Indian Standard Specification.

Module II
Quantity Surveying- Basic principles-Types of Estimate- Detailed estimate including quantities, abstract and schedule of rates of various items of works- residential buildings- workshop buildings- office/ school building, sanitary and water supply works- soak pits, septic tanks, overhead tanks, culverts, Retaining walls, road construction.
Bar-bending schedule-preparation of bar-bending schedule for RCC works connected with building construction, culverts and minor irrigation works.

Module III

References:
1. B N Dutta, Estimating and costing in Civil Engineering, USB publishers and distributors Ltd. New Delhi
2. M Chakrabarti, Estimating and costing in Civil Engineering, USB publishers and distributors Ltd. New Delhi
5. Methods of measurement of Building & Civil Engineering works, IS 1200-1968
7. George E Deathrage, Construction Schedule & Control, Mc Graw Hill

Question Paper: Duration: 3 hours
The question paper consists of Part A and Part B.
Part A is for 20 marks. There will be 4 compulsory short answer questions covering entire syllabus.
Part B is for 80 marks. There will be two questions from each module. The candidate has to answer one question from each module. Questions from module I & module III are carrying 15 marks each and questions from module II carries 50 marks each.

Note: For analysis of rate and cost estimation, unit rate and labour requirement should be given along with the questions by the question paper setter.
No other charts, tables, codes are permitted in the Examination Hall. If necessary, relevant data shall be given along with the question paper by the question paper setter.
Module I
Management – definition – Evolution of management thought - Scientific management - principles of scientific management advocated by Taylor and Fayol – relevance in construction industry.
Construction project management – life cycle of a construction project-data collection-techno-economic feasibility study-cost benefit analysis-rate of return analysis.

Module II

Module III

References:

Question Paper: Duration: 3 hours.
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question of 20 marks from each module.
Note: No charts, tables, codes are permitted in the examination hall. If necessary, relevant data shall be given along with the question paper by the question paper setter.
Module I

Module II

Module III
Behaviour of girder Bridges - Design concepts - Case studies on steel-concrete composite construction structures in buildings - seismic behavior of composite structures.

References:
1. ‘Teaching resource material for structural steel design,’ volume 2/3 jointly prepared 1) IIT, MS, 2) Anna University, SERC, MS, Institute for steel development and growth, Calcutta

Question Paper: Duration: 3 hours.
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question of 20 marks from each module.
Note: No charts, tables, codes are permitted in the examination hall. If necessary, relevant data shall be given along with the question paper by the question paper setter.
Module I
Design of Harbour / Port Structures - Loads on Wharfs, Jetties, Dolphins Live Load for different classes of Cargo - Dead load Wind / wave loads, Loads due to Crane Lateral loads Mooring & Berthing forces - fenders - Bollards

Module II

Module III
Breakwaters - Type and selection Criteria. Assessment of design input conditions. Environmental force. stability criteria. Design of Rubble mound, Caisson type, Vertical wall type. Different types of Armor units.

References:
3. Aionzo F Quinn ,’’Design and Construction of Ports and Marine Structures ‘’.
4. Harbour and Coastal Engineering-NIOT Chennai

Question Paper: Duration: 3 hours
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question of 20 marks from each module.
Note: No charts, tables, codes are permitted in the Examination hall .If necessary the same shall be given along with the question paper by the question paper setter
Module I
Types of pavements-Flexible, rigid and composite pavements-Functions of various layers of pavements-prime coat, tack coat, seal coat-Design factors, wheel load, equivalent single wheel load, repetition of loads, Elastic moduli, climatic variation-Comparison of Highway and Airport pavements.
Design of Flexible pavements-Analytical method-Stresses in homogeneous mass-Boussinesq’s theory-Burnmister’s layer theory-Group index method-IRC method of design
Design of overlays as per IRC
Performance based design-AASHTO method

Module II
Rigid Pavements-Westergaard’s approach-Bradbury’s stress coefficients-IRC method of design.
Temperature Stresses in Concrete pavements-Warping stress-Frictional Stress-Combination of stresses.
Joints in Concrete pavements-Necessity-requirements-Types-Expansion joints-Contraction Joints-Construction joints
Design of joints-dowel bars and tie bars
Design of Airport pavements-requirements of airport pavements,overview of design methodology,design of flexible and rigid airport pavements.

Module III
Road Construction- Wet mix macadam, bituminous macadam, premix carpet, bituminous concrete.
Highway drainage-principles of surface drainage-Design of cross section of drainage channel-sub surface drainage, base drainage, sub grade drainage
Pavement evaluation-Functional and structural evaluation-Distress-Serviceability concept-Pavement management System-Components of PMS (introduction only).

References

Question Paper: Duration: 3 hours
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question of 20 marks from each module.
Note: No charts, tables, codes are permitted in the Examination hall .If necessary the same shall be given along with the question paper by the question paper setter
Module 1
Meyerhof’s method for estimation of bearing capacity of isolated footings (no derivation required) – Effect of water table and inclination of loading on bearing capacity
Footings subjected to moments – eccentric loading – Solution using the two approaches proposed by Meyerhof

Module II
Graphical methods for lateral earth pressure on retaining walls – Rebhann’s method – Culmann’s method– Advantages – Design of gravity retaining walls
Active and passive earth pressure{ for both Ø soils and c- Ø soils} on retaining walls with earthquake forces – Extension of Coulomb’s theory (no derivation required)

Module III
Sheet pile walls – Types and uses – Analysis of cantilevered sheet pile wall in clays and granular soils.
Laterally loaded piles – Ultimate lateral resistance of vertical piles by Brom’s approach – Methods to improve lateral stability of piles

References:

Question Paper: Duration: 3 hours
The question paper consists of Part A and Part B.
Part A carries 40 marks. There will be 8 compulsory short answer questions covering entire syllabus.
Part B is for 60 marks. There will be 2 questions from each module. The candidate has to answer one question of 20 marks from each module.
Use of [i] Brom’s charts and [ii] Meyerhof’s bearing capacity factor Table are permitted.
Module I

Module II
Displacement-based Elements for Structural Mechanics:- Formulas for element stiffness matrix and load vector – overview of element stiffness matrices – Consistent element nodal load vector - Lump loads-Patch test - - Stress computation
Developments of shape functions for truss, beam and frame elements- Constant strain triangle -Linear strain triangle -Bilinear plane rectangular elements.

Module III
Isoparametric formulation - Line element- Plane bilinear element- Isoparametric formulation of Quadratic plane elements - Subparametric elements and superparametric elements - Gauss quadrature
Plate and shell elements. (Description only).
Solution Techniques for Linear Algebraic Equations – Storage schemes.
Discussion of Finite Element programs using ANSYS or NISA.

References:
4. Bathe, K.J., 'Finite Element Procedures in Engineering Analysis', Prentice Hall of India

Question paper:Duration: 3 hours
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions covering entire syllabus.
Part B is for 60 marks. There will two questions from each module. The candidate has to answer one question of 20 marks from each module.
Note: No charts, tables, codes are permitted in the Examination hall .If necessary relevant data shall be given along with the question paper by the question paper setter.
08.806.6 Elective-IV  PROBABILISTIC METHODS IN CIVIL ENGINEERING

Review: Probability, Sample space and events, Axioms of probability.

Module I

Module II
Moments of a random variable, moment generating functions, multi-dimensional random variables, Joint probability distribution, conditional and marginal distribution, covariance and correlation. (Problems on bivariate random variables only).
Functions of random variables – function of a single random variable, functions of two random variables,
Moments of functions of random variables.

Module II
Role of probability and statistics in civil engineering. Frequency analysis – estimation of probability of exceedence, Return period of extreme events such as flood and earthquake- Weibull’s formula, Estimation of characteristic compressive strength from sample values.
Structural Reliability, Performance function and limit surface, Margin of safety, First Order Reliability methods (FORM) –Cornell’s reliability index – Limitations, Geometric interpretation of reliability index – Hasofer Lind reliability index (Concept only, no numerical problems).
Concept of Monte Carlo Simulation, Introduction to reliability based design – Determination of partial safety factors (qualitative ideas only).

References:
5. Sheldon Ross, A first course in Probability, Pearson Education.

Question Paper: Duration: 3 hours
The Question paper contains Part A and Part B.
Part A carries 8 compulsory questions (short answer questions) covering the entire syllabus and is for 40 marks.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question out of two.
Module I
Vertical distribution of ground water. Types of geologic formations-properties of aquifer related to storage and transmissivity of water. Steady unidirectional flow-steady flow in a homogeneous aquifer-aquifer with recharge-Flow into infiltration galleries. Importance of groundwater modeling. Governing equations of ground water flow and boundary conditions (basic ideas only). Finite Difference discretization, Solution of partial differential equation of ground water flow for 1D steady ground water flow in homogeneous aquifers (confined and unconfined) using finite difference method (uniform mesh interval only).

Module-II

Module III

References:
7. Freeze and Cherry, “Ground Water” Prentice Hall

Question Paper: Duration: 3 hours
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question of 20 marks from each module.
Note: No charts, tables, codes are permitted in the Examination hall. If necessary the same shall be given along with the question paper by the question paper setter.
Module 1
Causes of deterioration in concrete structures – errors in design, construction operations, earthquakes, erosion, chemical reaction, corrosion, durability, etc.
Causes of deterioration in steel structures – corrosion, abrasion, loosening of connections, fatigue, impact, earthquakes, environmental problems, etc.
Preventive measures, maintenance and inspection

Module II
Diagnosis and assessment of deterioration, visual inspection, non destructive tests, ultrasonic pulse velocity method, rebound hammer method, pull out tests, Bremer test, Windsor probe test, crack detection techniques, etc.

Module III
Methods of repair of cracks, repairing spalling and disintegration, repairing concrete floors and pavements, repairing of corrosion damage of reinforced concrete, repair of steel structures
Strengthening of existing structures, guniting, jacketing, use of chemicals, application of polymers, ferrocement and fibre concretes, pre-stressing, surface coatings, painting, water proofing, grouting, special repairs.

References:
2. Dovkaminetzky, Design and Construction Failures, Galgotia Publication., NewDelhi
3. Jacob Field and Kennenth L Carper, Structural Failures, Wiley Europe

Question Paper: Duration: 3 hours
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question of 20 marks from each module.
Note: No charts, tables, codes are permitted in the Examination hall. If necessary the same shall be given along with the question paper by the question paper setter.
Module I
Relevance of Ground Improvement – In-situ Densification – Deep Compaction – Dynamic Compaction – Blasting – Sand piles
  Pre-loading with vertical drains – Stone Columns - Lime piles

Module II
Grouting – Electro chemical Stabilization – Physical and chemical aspects of stabilization – Stabilization with cement and lime - Mechanical stabilization - Electro osmotic methods

Module III
Drainage and Ground water lowering – Well point system

References:
2. P.Purushothamaraj Ground Improvement Techniques ,Pearson Education, Delhi, 1998

Question Paper: Duration: 3 hours
The question paper consists of Part A and Part B.
Part A carries 40 marks. There will be 8 compulsory short answer questions covering entire syllabus.
Part B is for 60 marks. There will be 2 questions from each module. The candidate has to answer one question of 20 marks from each module.
Module I
Review of structural dynamics– SDOF and MDOF systems– Free and forced vibration analysis – Base motion

Module II
Earthquake effects on masonry buildings - Earthquake resistant construction of masonry buildings-
Seismic effect on RC structures – Effect of architectural features and structural irregularities
Seismic design philosophy – Determination of design lateral forces – Equivalent lateral force method - Dynamic
analysis

Module III
Ductility considerations in earthquake resistant design of RC buildings – Discussion of relevant clauses in IS
code Earthquake resistant design of RC beams and columns

References :
1. IS 1893 (Part I) : 2002 Criteria for Earthquake Resistant Design of Structures Part I General
   Provisions and buildings
2. IS 13920 (Part I) : 1993 Ductile Detailing of Reinforced Concrete Structures subjected to Seismic
   Forces-Code of Practice
3. IS 456 : 2000 Code of practice for Plain and Reinforced Concrete
4. Anil K. Chopra ,Dynamics of structures, Prentice-Hall, India
5. Pankaj Agrawal and Manish Shrinkande, Earthquake Resistant Design of Structures, Prentice-Hall, India
6. Madhujit Mukhopadhyay, Structural Dynamics, Ane’s Books India

Question Paper: Duration:3 hours
The question paper consists of Part A and Part B.
Part A carries 40 marks. There will be 8 compulsory short answer questions covering entire syllabus.
Part B is for 60 marks. There will be 2 questions from each module. The candidate has to answer one question
of 20 marks from each module.
Use of IS 456:2000, IS 13920 (Part I), IS 1893 (Part I) are permitted in the examination hall.
Module I
Introduction – Evolution of EIA (Global and Indian Scenario)- Key Features of National Environmental Policy Act- Elements of EIA – Purposes – Screening – Scoping - Terms of Reference - Public Consultation - Environmental Clearance process in India - Key Elements in 2006 EIA(Govt. of India ) Notification

Module II
Socio-economic impacts - Impact types- Identification- Impact assessment Methodologies- Overlays, Checklist, Matrices, Fault Tree Analysis, Event Tree Analysis- Role of an Environmental Engineer- Public Participation- Introduction to latest softwares in water and air quality Modeling

Module III
Water Quality Analysis- Standards for Water, Air and Noise Quality - Impact of development on vegetation and wild life-Environmental Management Plan- EIA- Case study related to Hydro electric Project.

References:
2. Ministry of Environment & Forests, Govt. of India 2006 EIA Notification
5. John Glasson, Riki Therivel & S Andrew Chadwick “Introduction to EIA” University College London Press Limited

Question paper :Duration : 3 Hrs
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering entire syllabus.
Part B is for 60 marks. There will be 2 questions form each module. The candidate has to answer one question from each module.
Note: No charts, tables, codes are permitted in the Examination hall .If necessary the same shall be given along with the question paper by the question paper setter.
Module I
The measurement system - Purpose Structure and elements Characteristics of measurement system Accuracy, precision, repeatability Calibration Standards and evaluation. Dynamic Characteristics.
Statistical Analysis - errors in measurement - Best estimate of true value Normal Distribution - confidence level

Module II
Measurement of strain. Electrical resistance strain gauges. Vibrating wire strain gauges strain gauge bridges Force transducers Load cells different types force balance pressure gauges.
Measurement of displacement Linear Variable differential transformer, Applications - Motion measurement – Potentiometer.
Measurement of Acceleration, Accelerometers - Characteristics of Accelerometers. Integration technique for displacement from acceleration

Module III
Non Destructive Testing Methods - Ultrasonic methods - Hardness methods - Rebound Hammer - Detection of embedded reinforcement
Acoustic Measurement- Sound level meter Indicating & recording elements - Chart recorders – Cathode Ray Oscilloscope Computer based data acquisition systems

References:
5. Beekwith,” Mechanical Measurements”, Pearson
6. Dally J.W & Riley W.F,”Experimental Stress Analysis, McGraw Hill

Question Paper: Duration: 3 hours
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question of 20 marks from each module.
Note: No charts, tables, codes are permitted in the Examination hall .If necessary relevant data shall be given along with the question paper by the question paper setter.
Module-I
Seismology and earthquakes (basic concepts only)-Earthquake hazards related to Geotechnical engineering-
Wave propagation-Soil liquefaction-Susceptibility, initiation and effects of soil liquefaction- Laboratory and
Field methods for estimation of liquefaction potential-CSR and CRR.

Module –II
Measurement of dynamic soil properties-Seismic reflection and seismic refraction tests-Seismic cross hole,
down hole/up hole tests-SPT-High strain element tests-Cyclic tri-axial test-shake table and centrifuge tests.

Module-III
Introduction to bearing capacity and settlement analysis under earthquake loading –
Seismic design considerations- Codal Provisions - Site improvement methods for mitigation of earthquake
hazards

References:
2. Mike Jefferies and Ken Been-Soil Liquefaction –A critical state Approach, Taylor and Francis,
   London, 2006
4. Steven Kramer, Geotechnical Earthquake Engineering, Pearson, New Delhi, 1995
8. E.E. S.P. Timoshenko, D.H. Young and William Weaver, Jr., Vibration Problems in Engineering, John
   Wiley and Sons, 1974

Question Paper: Duration:3 hours
The question paper consists of Part A and Part B.
Part A carries 40 marks. There will be 8 compulsory short answer questions covering entire syllabus.
Part B is for 60 marks. There will be 2 questions from each module. The candidate has to answer one question
of 20 marks from each module.
Module I

Module II

Module III

References

Question Paper: Duration: 3 hours
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions covering entire syllabus.
Part B is for 60 marks. There will two questions from each module. The candidate has to answer one question of 20 marks from each module.
Module I

Module II

Module III

References:

Question Paper: Duration: 3 Hours
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering entire syllabus.
Part B is for 60 marks. There will be 2 questions form each module. The candidate has to answer one question from each module.
Note: No charts, tables, codes are permitted in the Examination hall .If necessary the same shall be given along with the question paper by the question paper setter.
Module I
Definition: Classification, Historical developments, planning and economic aspects related to choice of bridge type.
Standard specification for Rural and Railway Bridges: Clearances, live loads and impact allowances- wind loads - Longitudinal forces- Centrifugal forces- Earth pressures - Temperature effects - Secondary stresses- Erection stresses - Seismic forces.

Module II
Bearings: Concrete, steel and Neoprene bearing, Design of elastomeric pad bearings, Load distribution on Bridge Decks – Grid analysis- Courbon’s method - Orthotropic plate theory.
Reinforced Concrete Bridges: Review of the design of slab, T- beam - Principle of design of balanced cantilever and continuous girder bridges.

Module III
Pre-stressed Concrete Bridges: Principle of design of single span bridges- composite construction.
Steel Bridges: Design of plate girders, Principles of design of trussed bridges and cable stayed bridges.

References:
1. N. Krishna Raju, Design of bridges, Oxford and IBH
3. Raina, Concrete, Bridge Practice Analysis Design Economics, TMH
4. Johnson Victor, D, Essentials of Bridge Engineering, Oxford and IBH.

Question paper: Duration: 3 Hrs.
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering the entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question from each module.
Module I

Transportation Planning Process - Approaches to Transportation Planning Process - System approach – Cyclic approach - Elements of transportation planning process - Formulation of goals, objectives - collection of data - Analysis of existing condition - prediction techniques and analysis of future condition


Module II

Travel demand - concept of travel demand and its modelling based on consumer behaviour of travel choices - independent variables - travel attributes - Assumptions in demand estimation - sequential-recursive and simultaneous process.


Trip Distribution - Growth factor methods - Average factor method, Fratar, Furness method - Synthetic methods - Gravity model only.

Module III

Network Planning and Traffic Assignment - purpose, Types - All or nothing - Diversion curves, Capacity restraint Assignments. Assignment of public transport systems.

Modal split - Factors influencing modal choice, characteristics of journey, traveller, transportation system. Trip end modal split model - Trip interchange modal split models - Discriminant analysis.

Traffic And Environment - Detrimental effects of traffic on environment - Noise - Air pollution - Visual intrusion and degrading aesthetics.

Introduction to Intelligent Transportation Systems and Planning softwares

References:
2. Kadiyali, L R., Traffic engineering and Transport planning, Khanna Publication,

Question Paper: Duration: 3 hours

The question paper consists of Part A and Part B.

Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering entire syllabus.

Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question of 20 marks from each module.

Note: No charts, tables, codes are permitted in the Examination hall. If necessary relevant data shall be given along with the question paper by the question paper setter.
Module I
Importance of material management-objectives-Materials-categories-costs involved.
Purchasing principles - six rights – Organisation - Centralised - decentralised. Standardisation-Forms of specification-different levels - How an Indian standard is born - Advantages of standardisation.

Module II
Store-coding system - benefits - store function-responsibilities and functions - stores records and stores accounting.
Cost reduction through materials management-standardisation and variety reduction-value analysis-value function-cost and worth-selection of items for value analysis-techniques-value analysis job plan.
Computer application in material management - ideal areas for computerisation.

Module III
Inventory management-types of inventory-aims of inventory control - inventory turn-over ratio - costs associated with inventory-ordering cost - carrying cost - under-stocking cost - overstocking cost.
Selective control - ABC analysis - Economic order quantity-order point - lead time forecast usage per unit of time - safety stock-stock order point.
Replenishment systems - Perpetual Review system-periodic review system - Quantity to be recouped.

References:
1. Purchasing and materials management - Gopalakrishnan, TMH
2. An Integrated Concept of Materials Management - N.N. Shaw

Question paper: Duration: 3 Hrs.
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering the entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question from each module.
Note: No charts, tables, codes are permitted in the Examination hall. If necessary relevant data shall be given along with the question paper by the question paper setter.
Module I
General Optimisation procedures - and features of mathematical programming as applicable to Civil engineering problems. Unconstrained and constrained optimization problems - Formulation of objective function and constraints.

Module II

Module III
Linear Programming - Simplex method standard form - Simplex algorithm - Two phase solution by simplex method - Duality of linear programming Formulation of geometric programming - Dynamic programming and integer programming problems-Minimum weight design of trusses and frames.

References:
3. Optimisation concepts and Applications Engineering, Belegundu.

Question Paper:
Duration: 3 hours
The question paper consists of Part A and Part B. Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question of 20 marks from each module.

Note: No charts, tables, codes are permitted in the Examination hall. If necessary relevant data shall be given along with the question paper by the question paper setter.
08.807.8 Elective V.  IRRIGATION AND DRAINAGE ENGINEERING

Module I
Soil Plant Water relationships-soil physical properties influencing irrigation-kinds of soil water-movement of water into soils-infiltration and measurement-soil moisture retention and movement-soil water potential-soil moisture characteristics-soil moisture constants-measurement of soil moisture-tensiometer, neutron moisture probe (only concepts).
Plant water relationships- Crop response to water-moisture stress and plant response-drought tolerance-root characteristics and moisture use-evaporation, transpiration and consumptive use-measurement of evapotranspiration-Estimating evapotranspiration from evaporation and climatological data-methods (Blaney criddle, Thornthwaite, Penman and Christiansen only)-Crop co-efficient and evapotranspiration of a crop.

Module II
Irrigation-selection of irrigation water application methods-irrigation requirement-surface irrigation methods-details and hydraulics design aspects of border, check basin and furrow methods
Quality of irrigation water-problems, criteria, classification-Salt problems in irrigated agriculture-influence of salts on physical properties of soil-salt balance-leaching requirement-methods.

Module III
Drainage of irrigated land-Surface drainage and land forming- different systems for surface drainage (layout and description only).
Subsurface drainage –benefits-drainage requirements-pipe drains, mole drains-types of system (layout and description only)-Outlets, types-depth and spacing of drains ( Design for steady state condition only)- size of pipe drains-design flow -hydraulic design for drain size.
Drainage Surveys-Data to be monitored, Preliminary surveys, Detailed Surveys

Reference:
4. Drainage principles and applications- ILRI publication 16

Question Paper: Duration: 3 hours
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question of 20 marks from each module.
Note: No charts, tables, codes are permitted in the Examination hall .If necessary relevant data shall be given along with the question paper by the question paper setter.
Module – 1
Transportation System Management -objectives and scope - Need for TSM, TSM Process outline, TSM Strategies - Performance Measures.
Traffic Operations Improvement: On-street parking ban, one-way streets, reversible lanes, traffic calming, Right turn phase, right turn lanes, reroute turning traffic, Auto Restricted Zones - Traffic Diveters

Module – 2
Study of TSM actions with respect to problems addressed, conditions for applications, potential implementation problems, evaluation & impact analysis- park and ride, Ridesharing, exclusive lanes, priority at ramp terminals, bus transfer stations, limited and skip-stop bus services, Public transportation & HOV treatment
Demand Management: Staggered work hours, flexible work hours, high peak period tolls, shuttle services, circulation services, extended routes.

Module-3
Local Area Traffic Management - Data Requirements - pedestrian Facilities - Planning for pedestrians, Bicycle Facilities - Design. Non Motorized Transport: pedestrian only streets, Dial a ride for elderly & handicapped
Parking Management: Benefits of good parking management, curb parking, off street parking, Parking supply and demand. , Parking and Terminal Facilities.

References:

Question paper: Duration: 3 Hrs.
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions of 5 marks each covering the entire syllabus.
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question from each module.
Note: No charts, tables, codes are permitted in the Examination hall. If necessary relevant data shall be given along with the question paper by the question paper setter.
Module I
Introduction-history—ancient and modern structures-application areas
General theory - Stress strain relationship of reinforced soil – Preferred pattern of reinforcement - Factors affecting the performance and behaviour of reinforced soil –Properties of reinforcement, reinforcement distribution, soil properties, soil state, construction procedure - Action and relevance of reinforcement in soils
Materials - Cohesionless fill – Cohesive frictional fill - Cohesive fill
Reinforcement - Types of reinforcing materials – Properties - Facings

Module II
Design - Conceptual design-General aspects - Overall stability of vertically faced structures - Different Methods Analysis and design of reinforced retaining structures with metallic reinforcement - Simple problems Bearing capacity of reinforced earth foundation-Brief discussion of Binquet and Lee’s Method

Module III

References:

Question Paper: Duration: 3 hours
The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions covering entire syllabus.
Part B is for 60 marks. There will two questions from each module. The candidate has to answer one question of 20 marks from each module.
Note: No charts, tables, codes are permitted in the Examination hall .If necessary relevant data shall be given along with the question paper by the question paper setter.
Module I

Classification of Industrial structures-Layout requirements-lighting, ventilation and fire safety-protection against noise and vibration-factories act.
Roofing configuration-types of trusses-beams and lattice trusses-purlins-ferrocement-detailed design-spacing – Concrete roofs-Grid floors, shells and folded plates.

Module II

Storage structures-silos and bunkers-Shape of hopper for different materials-design of vertical sides-hopper bottom-stiffening gorder-staging-design-conveyors and supporting structures.Intz type water tanks.

Module III

Rigid industrial frames-gable frames of uniform cross sections-varying depth-pin jointed knee bracings-design of joints-analysis by various methods. Power transmission lines-Load Analysis and design of transmission line towers-substation structures-Foundation analysis-Design principle only.

References:
2. Salmon, C.G and Johnson J.E,”Steel structure-Design and Behaviour”, Harpr and Row-1980
4. Steel designers Manual published in UK
5. Arya and Ajmani,”Design of steel structures”Netrichand Bros, Roorkee, 1990

Question Paper: Duration: 3 hours

The question paper consists of Part A and Part B.
Part A is for 40 marks. There will be 8 compulsory short answer questions covering entire syllabus.
Part B is for 60 marks. There will two questions from each module. The candidate has to answer one question of 20 marks from each module.
Note: No charts, tables, codes are permitted in the Examination hall. If necessary relevant data shall be given along with the question paper by the question paper setter.
08.807.12. Elective-V  GEO-ENVIRONMENTAL ENGINEERING

Module I
Waste Generation – source, type, quantity, characteristics and management of waste;
Geotechnical properties of solid waste - density, particle size, temperature, pH, moisture content, compressibility, permeability, shear parameters; geotechnical reuse of waste materials;
Waste dump - changes occurring in waste dump, impact on environment, remedial measures for waste dump

Module II
Engineered landfill – types, selection and ranking of landfill sites based on sensitivity index – landfill planning-
components of landfill – land fill capacity-
Liner and cover system - compacted clay liner, geomembrane liners, geosynthetic clay liner - insitu permeability measurement of clay liners,
Leachate quality and quantity collection pipes, drainage Materials; leachate recirculation and Treatment; Gas management and collection facilities.

Module III
Soil waste interaction; contaminant transport - advective, diffusive, dispersive and combined process - attenuation capacity- change in engineering properties; permeability, shear strength, atterbergs limit, compressibility and swell.
Soil remediation- soil washing, fixation, electrokinetic remediation, biological treatment, thermal treatment and containment

References:
1. Datta M, Waste disposal in engineered landfills, Narosha publication New Delhi, 1997

Question Paper: Duration: 3 hours
The question paper consists of Part A and Part B.
Part A carries 40 marks. There will be 8 compulsory short answer questions covering entire syllabus.
Part B is for 60 marks. There will be 2 questions from each module. The candidate has to answer one question of 20 marks from each module.
Module I
Systems engineering - System definition and examples of civil engineering systems, system analysis, system design and system synthesis. Steps in analysis of systems - Mathematical modeling of systems - Optimization problems - Objective function and constraints.
Formulation of the following optimization problems for civil engineers - Minimum weight design of trusses and frames, minimum cost design of beams, column design based on Euler’s theory of buckling load, Optimal design of water distribution systems, single reservoir operation, Minimum cost design of lined irrigation canals. Traffic signal time optimization, Effluent disposal to rivers.
Concavity and convexity of optimization problems - Solution of single variable optimization problems - Calculus based methods, Newton, bisection and secant method.

Module II
Solution of multi variable optimization problems - Lagrange multiplier method - KKT conditions. Unconstrained optimization techniques for multi variable problems - direct search methods, Random search, uni-variate and pattern search - Hook and Jeeve’s method, Descent methods - Fletcher and Reeves method, Quasi-Newton methods (conceptual idea only).
Constrained optimization and constraint handling - penalty function approach (conceptual idea only).

Module III
Dynamic programming (DP) - Bellman’s principle of optimality, Application of DP to a pipe network problem.
Basic ideas of integer programming and multi-objective optimization (Descriptions only).
Evolutionary algorithms for optimization - Basic principles of Genetic Algorithms, Simulated Annealing and Swarm Intelligence Techniques (Ant colony optimization and particle swarm optimization) (conceptual ideas only).
Simulation - Concept of Monte Carlo Simulation (No numerical problem).

References/ Text Books
1. Fox R L - Optimization methods for engineering design – Weily
3. Belegundu and Chandrapatla- Optimization concepts and applications in engineering-, Prentice Hall India Ltd
4. Deb K - Optimization for engineering design - Algorithms and Examples-, Prentice Hall India Ltd
5. Haftka R T and Gurdal Z - Elements of structural optimization - Springer
7. Engelbrecht A P - Fundamentals of computational swarm Intelligence - Weily
8. Kennedy J and Eberhart R C - Swarm Intelligence - Morgan Kaufman
9. Arora J S - Introduction to optimum design- Elsevier
10. Vedula P and Mujumdar P P - Water resources systems- TMH

Question paper: Duration: 3 Hrs
The question paper consists of part A and part B.
Part A consists of 8 questions of 5 marks each. Candidate has to answer all questions.
Part B is for 60 marks. Part B is divided into three modules. Candidate has to answer one full question out of two, from each module.
Note: At least one assignment should be computer oriented. The candidate should practice to solve simple optimization problems from civil engineering field using any commercial software.
Sessional marks 100 for 08.808 can be awarded as $80 + 20$ for project and industrial visit respectively. 80 marks for project can be distributed as $40 + 40$, where 40 marks will be awarded by the guide of the project and 40 marks by the evaluation team comprising of guide and not less than two staff members. The students have to present their work before the evaluation team and appear for a close-in examination. The marks given by the evaluation team must be based on the quality of project, performance of the students in the presentation and close-in examination.

Industrial visit should be completed before the commencement of 8th semester and a detailed report of the same has to be submitted. The report should be evaluated for 20 marks.