

## VII Semester B.E.(Civil)

7CE01/7ST01

Structural Analysis-III

(4L + 1 T + 2 P)

### SECTION-A

#### UNIT-I

1. Basic concept, Degree of Freedom, Basic concept of Direct Stiffness Method. Formulation of elemental/local stiffness matrix and global stiffness matrix for **plain truss**. Transformation Matrix, Assembly of Global / Structure stiffness matrix up to (8x8). Member load matrix, Assembly of Global / Structure load matrix, Solution to problems with maximum degree of freedom four.

#### UNIT-II

2. Formulation of element / local stiffness matrix and global stiffness matrix for **Beam members** (without axial deformations) for continuous beams, Transformation matrix Assembly of global / structure stiffness matrix, Member load matrix due to concentrated loads, uniformly distributed Loads, Moments Assembly of global/ structure load matrix up to (8x8) Solution to problems with maximum degree of freedom four.

#### UNIT-III

3. Formulation of element / local stiffness matrix and global stiffness matrix for **Plane Frame** member (With axial deformation), Transformation Matrix, Assembly of global / structure stiffness matrix, Member load matrix due to concentrated loads, uniformly distributed Loads, moments, Assembly of global/ structure load matrix.  
Solution to plane frame problems with maximum degree of freedom six, Inclined member problems.

### SECTION-B

#### UNIT-IV

4. Formulation of element / local stiffness matrix and global stiffness matrix for **Plane Grid** transformation Matrix, Assembly of global / structure stiffness matrix, Member load matrix due to concentrated loads, uniformly distributed Loads, moments, Assembly of global/ structure load matrix. Solution to problems with maximum degree of freedom six.

#### UNIT-V

5. Analysis of Member for temperature loading, initial joint displacement (sinking of support), lack of fit in trusses, trusses with inclined roller, storing of global / structure stiffness Matrix, full storage, banded storage, band Mininisation

#### UNIT-VI

6. Introduction to finite Element method, basic concepts, discretisation of structure, Rayleigh Ritz member for bar elements (prismatic/ Non- prismatic) Displacement based Bar elements (prismatic/ Non- prismatic) and Bean elements (prismatic), Load Matrix for body forces.

**Note:** There shall be one question with 4 DOF & rest with 3DOF.

**PRACTICAL:**

Minimum Eight Problems, on complete syllabus with hand calculations using scientific calculators and also solution to same problems by using available readymade software. (Solution is restricted to four degree of freedom problems and assembly restricted to eight degree of freedom problems)

**BOOKS:**

1. Matrix Method of Structural Analysis - Gere and Weaver
2. Computer Analysis of Structures - Beaufait, Rowen, Headly et al
3. Computer Analysis of Structures - Flemmings
4. Computational Structural Mechanics, S Rajasekaran & G Sankarasubramanian
5. Finite Element Method – R D Cook

(VII-01)

**SECTION A**

( Three question of 13/14 marks are to be answered out of Five questions of 13 marks-one question of 14 marks – to be set on Units I to III )

**Unit – I**

1. Limit state of collapse in flexure : Analysis and design of doubly reinforced rectangular, Tee and L-sections.      (4)
2. Limit state of collapse in torsion : Concept of interaction of torsion, shear and flexure. Analysis and design of rectangular section for torsion, shear and flexure.      (3)
3. Limit state of serviceability : Deflection calculations for beams and one-way slabs.      (3)

**Unit – II**

4. Analysis and design of columns subjected to biaxial moments. Design of long columns.      (5)
5. Design of Isolated footing , for uniaxial and Biaxial bending. For Square , Rectangular & Circular.      (5)

**Unit – III**

6. Moment redistribution :Analysis and Design of fixed beam, propped cantilever, two-span symmetric continuous beam.      (10)

**SECTION B**

(Two question of 20 marks are to be answered out of Three questions of 20 marks each to be set on Units IV and V )

**Unit-IV (with LSM)**

7. Analysis and design of portal frames ( single bay single storey) hinged or fixed at base. Design of hinge and design of foundation.      (5)
8. Design of combined footing      (10)
  - i) Rectangular footing.
  - ii) Strap beam footing.
  - iii) Trapezoidal footing.
  - iv) Raft footing.

(VII-02)

### **Unit – V ( with LSM )**

9. Design of RCC Two way slab with various end conditions using with IS Code coeff. (5)
10. Design of R.C.C. Cantilever and counterfort Retaining wall (10)

### **PRACTICALS**

Practical work shall consist of

1. Design assignments with detailed drawing on A-2 size sheets and detailed calculations in journal.
  - i) Two way slab with various end conditions.
  - ii) Cantilever/ Counterfort retaining wall.
  - iii) Combined footing.
  - iv) Portal frame.
2. One field visit & its report in journal.

**(VII-03)**

**SECTION-A****UNIT-I**

## 1. GENERAL: (03)

Necessity and importance of Irrigation Engineering; Benefits & ill effects of Irrigation; Classification of Irrigation; General principles of flow, lift, perennial, inundation Irrigation systems; Comparative study of sprinkler and drip Irrigation systems.

## 2. WATER REQUIREMENT OF CROPS: (07)

Suitability of soils for Irrigation ; Standards of irrigation water; PET-R method of crop water requirements; Depth and frequency of irrigation; definitions of field capacity, wilting point, available moisture, duty, delta, GCA, CCA, kor depth, base period, outlet factor , capacity factor, time factor, root zone depth: Relation between duty and delta; Factors affecting duty; Principal crops in India; Crop rotation; Methods of assessment of irrigation water .

**UNIT-II**

## 3. RESERVOIR PLANNING: (06)

Selection of site for Reservoirs; Engineering surveys, Geological and Hydrological Investigations; Fixing of LWL, FTL, TBL, HFL; Different storage zones in reservoir; Determination of storage capacity by mass curve method; Reservoir sedimentation; Life estimation of reservoir by Brune's method; Organisation & Administration of Irrigation projects.

## 4. DAMS:

## (A) GENERAL: (01)

Classification of dams as per use , hydraulic design and materials; Factors governing selection of type of dams.

**UNIT-III**

## (B) GRAVITY DAM: (06)

Definition; forces acting on gravity dam; stability requirements; Theoretical & practical profile of gravity dam; Low & High dam; Galleries.

## (C) EARTHEN DAMS: (06)

Types of earthen dam; Description of component parts of earthen dams- foundation, cut off trench, rock toe, hearting, central impervious core, pitching and chipping, turfing; Seepage through body of earthen dam and drainage arrangements; Failure Of earthen dams; Plotting of phreatic line for homogeneous earthen dams with horizontal filters ; Stability of foundation against shear.

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## SECTION-B

### UNIT-IV

#### 5. SPILLWAYS: (05)

Types of spillway with their working operations; General principle of design of ogee spillway; Spillway gates- vertical lift, radial , rolling and drum; Energy dissipation methods d/s of spillways.

#### 6. DIVERSION HEAD WORKS: (07)

Component parts of diversion headworks – Fish ladder ,guide wall, divide all, silt excluder and silt ejector; Causes of failure of weirs on permeable foundation; Bligh's Creep theory; dr. Khosla's theory for design of wiers on permeable foundations.

### UNIT-V

#### 7. CANALS:

##### (A) GENERAL: (02)

Types of canal; Alignments of canal; Cross section of Irrigation canals; Balancing depth; Schedule of area statistics; Losses in canals

##### (B) CANALS IN ALLUVIAL SOILS: (05)

Kennedy's silt theory – Design procedure ,silt supporting capacity, drawbacks; Lacey's silt theory- Definition of initial final and permanent regime channels, Lacey's Regime equation, channel design procedure, drawbacks; Garret's diagram for channel design.

##### (C) LINED CANALS: (03)

Design procedure; Types of lining; relative merits and demerits of canal lining; Economics of canal lining.

### UNIT-VI

#### 8. CANAL STRUCTURES:

##### (A) CANAL REGULATION WORKS: (03)

Only theoretical aspects of location, objects, classification ,components and schematic section of Head Regulator, Cross regulators, canal escapes, Canal falls and canal outlets.

##### (B) CROSS DRAINAGE WORKS : (02)

Only theoretical aspects of location , objects, classification, components and schematic section of aqueducts, siphon aqueducts, super passege, canal siphon, inlets outlets and level crossings.

#### 9. WATER LOGGING AND LAND DRAINAGE: (03)

Causes, effects, preventive measures of water logging, Types of drains, Layout of tile drains system; flow of ground water to drains.

(VII-05)

10. RIVER TRAINING WORKS: (02)

Defination; Classification; theoretical aspects of river training works like as Guide banks, Groynes and Spurs, Bank protection.

**PRACTICALS:**

Following Designs and Drawing should be included (Minimum Five)

1. Reservoir Planning- Capacity of reservoir.
2. Life of Reservoir
3. Gravity Dam – Checking of various modes.
4. Earthen Dam – Phreatic Line , checking of foundation against shear
5. Design of canals (Lined and Unlined)
6. Design of Lift Irrigation Scheme.
7. Drawing of various canal structures.
8. Site visit to irrigation project – Detail report should be submitted.

**Recommended Books:**

1. Irrigation Engineering and Hydraulic Structures- Santosh Kumar Garg
2. Irrigation Engineering and Hydraulic Structures- S.R. Sahastrabudhe
3. Irrigation Engineering and Water Power Engineering- B.C. Punmia
4. Irrigation Engineering and Hydraulic Structures- K.R.Arora
5. Irrigation Engineering- N.N. Basak
6. Irrigation Engineering and Hydraulic Structures-R.K.Sharma
7. Irrigation Engineering- G.L. Asawa
8. Water Resource Engineering Principles and Practice-C.S. Murty
9. Water Resources and Irrigation Engineering- P.N. Modi

(VII-06)

**SECTION-A****UNIT – I**

## 1. INTRODUCTION :-

Deterioration of structures. Definition of maintenance, Need for maintenance of different Civil Engineering structures. Maintenance characteristics that influence maintenance needs. A study of the cause of neglect and poor maintenance of structure. Measure of maintenance. [3]

## 2. CLASSIFICATION OF MAINTENANCE WORK :-

Servicing, rectification, replacement, planned, unplanned, preventive, corrective, predictable and avoidable maintenance works. Renovation and Rehabilitation. [3]

## 3. COMMON MAINTENANCE PROBLEMS :-

Relating to various Civil Engineering Structures and systems. Technology of maintenance. Area prone to frequent maintenance. Causes that aggravate maintenance work like high rise buildings. Special construction methods, new materials, difficult accessibility, Environment etc. [4]

**UNIT – II**

## 4. FACTORS AFFECTING INCIDENCE AND MAGNITUDE OF MAINTENANCE WORK :-

Over loading, movement of grounds, temperature variations, moisture leakages and dampness, chemical actions and corrosion, growth of trees, earthquake, flood and fire, riots and vandalism. Design defects. Defects in construction and use of materials, choice of materials for durability and maintainability. Design, expose and other factors effecting durability, precautions to increase durability. [5]

## 5. Inspection, Identification and diagnosis of Common defects and failures with possible causes in buildings, Roads, Bridges, Railway Tracks, Canals and C.D.Works, Tunnels and Special Structures like Service Reservoirs, Water Supply, Sewerage, Storm water Drains, [5]

**(VII-07)**



### UNIT – III

#### 6. PREVENTIVE MAINTENANCE :-

General - Site selection, choice of structural systems and materials, specifications & detailing. Buildings Special attention to foundations, wells, roofs, terraces, floors, doors and windows, plinth, compound walls, expansion joints stair cases to improve maintainability. Pumping and sanitary works. Termite control. External finishes. Roads Stabilization techniques, compaction and drainage, slope protection, joints in C.C. Pavements, Routine and service maintenance. Bridges and C.D. Works Repairs, strengthening and rehabilitation. Service life and expected Road carrying capacity. Service and Stability requirements. Future service requirements, loads, fatigue, creep. [10]

### SECTION-B

### UNIT – IV

#### 7. MATERIALS AND TECHNIQUES FOR MAINTENANCE :-

Materials for repairs like cement, cement grouts, epoxy grouts, mortars and coatings, polymer concrete composites, sealants, membrane overlays, fiber reinforcement concrete, Resin based compounds, emulsions and paints, geotextiles. Techniques like stiffening, linings, guniting, protection systems, prestressing, Post-tensioning and base isolation technology. Temporary supporting systems for Structures like timbering, shoring etc. [5]

#### 8. ECONOMICS OF MAINTENANCE :-

The burden of maintenance work, complexity of the work and the conflicting interests involved. Various economic factors that affect maintenance work. Initial and user costs. Impact of inflation on maintenance. Life of structures : Structural life and economic life. Basics of life cycle costing Techniques. 5]

(VII-08)

## UNIT - V

### 9. MAINTENANCE PLANNING :-

The deeper significance of maintenance as opposed to cosmetic treatments. Broad action plan, planning, Budgeting and controlling the cost of maintenance work. Policy formulation, standards of maintenance, Controlling Cost. Planned maintenance. Inspection cycles and condition surveys. Investigations for assessing condition of structures including non-destructive evaluation techniques like proof load test, photogrammetric analysis, asets and optelectric motion analysis, bovescopes, fiber-optic probes, chain-dragging, acoustic emission and ultrasonic techniques, infrared thermography, high-speed non-contact sensors, sonar and sound penetrating radar techniques. Reliability rating. Maintenance cost records. Maintenance manuals, their function. contents and types. Difficulties in the way of planned maintenance. [10]

## UNIT - VI

### 10. MAINTENANCE ORIENTED DESIGNS :-

Design and its relation to maintenance. Relation ship between initial, maintenance and running costs. Cost appraisal techniques. Consideration of maintenance at design stage. Design needs. Importance of feed back. Feed back systems. Information gathering, the design data communication. Interaction amongst designers, contractors. Uses maintenance and researchers. Maintainability, role of design professional. [4]

### 11. MAINTENANCE MANAGEMENT :-

Need for data. Data relationship of the data base system to management process. Cost data bases and management. Uses of data base. Problems in data collection and use. Setting criteria from data collected, operational assessment. [3]

### 12. RESEARCH INTO MAINTENANCE :-

Importance of research. Areas of research including materials, techniques, field equipment and tools for investigation, repairs and monitoring non-destructive evaluation techniques. [3]

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### **SELECT REFERENCE BOOKS:-**

1. Building maintenance by Ivor H. Seeley; The Macmillan Press Ltd.
2. Facilities Maintenance and Repair of damaged structures by Karper. A. Compilation of technical papers issued by maharashtra – India Chapter of American Concrete Institute.
3. Building Maintenance Economics and Management, Edited by Alan Speeding, E. & F. N. Spon, London.
4. Proceeding of the All India Seminar on Maintenance of Civil Engineering Structures and systems, Nagpur.
5. Common Building Defects, Diagnosis and Remedy, compiled by National Building Agency, Construction Press, London and New York.
6. Learning from Failures, Deficiencies in Design. Construction and Service, by R. N. Raikar, Structural Designers and Consultants Pvt. Ltd., New Bombay
7. I.R.C / B.I.S / C.B.R.I. Publications.

**(VII-10)**

**7CE05 Elective-I OBJECT ORIENTED PROGRAMMING IN C++**  
**(3 L+1T)**

**SECTION-A**

**UNIT-I**

**1. Program Design**

Introduction to Problem Definition, Modular Program Design, Program Composition, Comments, Statements, Flow Control, Functions, Modules, Dynamic Memory Management, Program evaluation and testing, Program documentation, Object Oriented Formulations

Data Types : Intrinsic Types, User Defined Data Types, Abstract Data Types.

**UNIT-II**

**2. Object Oriented Programming Concepts**

Introduction, Encapsulation, Inheritance, and Polymorphism, Object Oriented Numerical Calculations, Operator Overloading

Features of Programming Languages : Comments, Statements and Expressions, Flow Control, Explicit Loops, Implied Loops, Conditionals, Subprograms, Functions, Global Variables, Exception Controls. Interface Prototype. Characters and Strings, User Defined Data Types, Overloading Operators, User Defined Operators, Pointers and Targets, Pointer Type Declaration, Pointer Assignment, Using Pointers in Expressions Pointers and Linked Lists , Accessing External Source Files and Functions, Procedural Applications .

**UNIT-III**

**3. Object Oriented Methods : Inheritance and Polymorphism**

Introduction,, Example Applications of Inheritance, Polymorphism

**SECTION-B**

**UNIT-IV**

**4. OO Data Structures**

Data Structures , Stacks , Queues, Linked Lists, Linked Lists, File, Direct (Random) Access Files

**UNIT-V**

**5. Arrays and Matrices**

Subscripted Variables: Arrays , Initializing Array Elements , Intrinsic Array Functions, User Defined Operators, Computation with Matrices, multi-file programmes

**UNIT-VI**

**6. Advanced Topics : Templates, Virtual functions, Exceptions**

**Reference:**

1. Robart Lofare 'Object Oriented C++'
2. Robart Lafore,' OOP in Turbo C++'
3. Balagurusamy, ' OOP with C++'
4. Prata,' C++ Primer Plus'
5. N Barkakati,' OOP in C++'

(VII-11)

**7CE05 - Elective – I      Traffic Engineering**  
**(3 L+1T)**

**SECTION-A**

**Unit - I**

1. General  
Road, Road user & Road Vehicle Characteristics Traffic on Indian Roads.
2. Traffic Surveys:  
Speed, journey time and delay studies, methods of measurement of spot speed headways gaps volume/ capacity surveys speed, volume-density interrelations, measurements of running and journey speeds Origin-Destination surveys necessity, survey methods sample size, data analysis & Presentation, Highway capacity, level of service concepts.(10)

**Unit - II**

3. Traffic Events:  
Statistical methods for interpretation Regression application of Binomial, Normal Poisson distributions, Discrete and continuous distribution to traffic flow, Test of significance - Chisquare & 'T' test.(4)

**Unit - III**

4. Road Geometry's:  
Hierarchy of urban roads and their standards Diverging, merging crossing weaving manouver's, conflict points, types of road junctions channelization of traffic flow, traffic rotary design Grade separated intersections, Drive ways, design of pedestrian facilities Design criteria for separate cycle track, Exclusive Bus lane.(12)

**SECTION-B**

**Unit - IV**

5. Traffic Control:  
Traffic signs, road markings, traffic signals, design of signalized intersections & signaling systems, queing Theory, Traffic control aids, and street furniture.(10)

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### **Unit - V**

6. Traffic Safety:  
Driver error, vehicle & road surface Laws and enforcement traffic accident conditions in India Collection and interpretation of accident data and recording in Std. from skidding speed and weather effects on accidents, Analysis of Accidents. Pedestrian cyclists & auto vehicle drivers safety. Traffic regulation 3R and 5E's of traffic management.(8)
7. Enforcement and Education:  
Motor Vehicle act and Rules, Education, Need and Methods, Air pollution & Noise Pollution by Traffic.(2)

### **Unit - VI**

8. Parking:  
Parking surveys, on and off street parking & parking systems, parking demand, design of off-street parking lot, underground & Multistoried parking.(4)
9. Urban Traffic:  
Urban transportation problems and Analysis of characteristics of mixed traffic flow, head and administrative set up of traffic colls at various levels, co-ordination with other transport modes, traffic organisation. General principles of urban transport planning in context to India cities(specially metropolitan).(8)

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7CE05

ELECTIVE -I

ADVANCED HYDRAULICS

(3L+ 1T)

**SECTION-A**

**UNIT-I**

1. Computation of uniform flow. Computation of critical flow. (04)
2. Theory of gradually varied flow. Analysis of surface profile of gradually varied flow. (05)

**UNIT-II**

3. Computation of gradually varied flow, Bresse's method, Chew's method, Direct step method, standard step method.(10)

**UNIT-III**

4. Theory of Hydraulic jump, Location of hydraulic jump, application of hydraulic jump in design of hydraulic jump type stilling basin with horizontal apron (10)

**SECTION-B**

**UNIT-IV**

5. Equation of unsteady flow in a pipe line for incompressible fluid. Time of flow establishment. Rigid water column theory of water hammer and computation of water hammer pressures. (10)

**UNIT-V**

6. Equation describing water hammer phenomena when compressibility of fluid and elasticity of pipe is considered, computation of water hammer pressure of frictionless flow in horizontal pipe, for sudden and slow closer of valve, Application of allievi's method and charts approximate pressures. Water hammer pressures in pumping systems. Method characteristics. (08)

**(VII-14)**

7. Computation of water hammer pressures in branched pipe system and in surge tank system. Various devices, used for protection from water hammer pressures. (03)

#### **UNIT-VI**

8. Function of surge tank and different type of surge tanks. Equations governing the flow in the simple surge tank system. Analysis of flow in a simple surge tank system. Computation of maximum surges in a simple surge tank, study of problem of hydraulic stability in a simple surge tank system. (10).

#### **Recommended books:**

1. Flow through open channels - K.G.Ranga Raju
2. Open channel hydraulics - Ven Te Chow
3. Flow in open channels - K.Subramanya
4. Fluid mechanics - Streeter & Wylie
5. Fluid mechanics for Engineers - P.N.Chatterjee

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**7CE05 : ELECTIVE-I: SOIL DYNAMICS (3L+1T)**

**SECTION-A**

**UNIT-I:**

1. Elastic properties of soils, applicability of Hooke's law to soils, elastic constants of soil and their determination. Coefficient of elastic uniform compression and shear; cyclic plate load test. (6)

**UNIT-II:**

2. Theory of vibration, degree of freedom, theory of free & forced vibrations, natural frequency, resonance, effect of soil inertia on forced vertical vibration of foundation, methods/approaches of determining dynamic characteristics of soil-foundation systems :empirical method, Pauw method, Balkrishna-Nagraj approach, Richert's elastic half space approach. (9)

**UNIT-III:**

3. Strength & deformation characteristics of soil under dynamic loads, liquefaction in soil, criteria of liquefaction field and laboratory assessment of liquefaction. (6)

**SECTION-B**

**UNIT-IV:**

4. Residual soil settlement under dynamic loads, damping property of soil, effects of vibration on internal friction, cohesion, viscosity, porosity & permeability; vibroviscous soil resistance. (6)

**UNIT-V**

5. Earthquakes, earthquake effects on soil-foundation system ,types of waves & their characteristics ,response spectrums, seismic forces and damage potential indices. (4)
6. Propagation of elastic waves in isotropic material, application to dynamic problems ,energy transmission from machine foundation in elastic half space. (4)

**(VII-16)**

**UNIT-VI:**

7. Machine foundation: Special features, resonant frequency of block foundation, permissible amplitudes. Analysis & design of single engine reciprocating machine foundation, methods of decreasing vibrations of foundation. (7)

**Books :**

1. Shamsheer Prakash: Soil Dynamics.
2. Barkan, D.D: Dynamics of Bases & Foundation
3. Richarts, Hall & Woodes: Vibrations of soils & Foundations.
4. Winterkom H.F. and Fang H: Foundation Engineering handbook

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7CE05:ELECTIVE - I: AIR POLLUTION AND SOLID WASTE MANAGEMENT  
SECTION - A

(3 L+1T)

**Unit - I**

1. Introduction to air pollution : Definition, air pollution episodes, atmosphere and its zones. (4)
2. Classification and sources of air pollutants (2)
3. Effects of air pollutants on man, plants animal & materials (3)

**Unit - II**

4. Meteorolgy and air pollution : Primary and secondary parameters, atmospheric stability, plume behaviour. (5)
5. Air sampling and measurement: ambient air sampling and stack sampling, collection of particulate and gaseous pollutants, methods of estimation. (6)

**Unit - III**

6. Air pollution control methods and equipments: Principle of control methods for particulates and gaseous pollutants, gravity settlers, electrostatic precipitators, bag filters cyclones, wet scrubbers (6)
7. Automobile exhaust: Pollution due to diesel and petrol engines, exhaust treatment and abatement. (3)
8. Noise Pollution: Sources, ill effects, control measures. (1)

**SECTION - B**

**Unit IV**

9. Introduction to solid waste management. (2)
10. Sources, quantity and quality: Sources of solid waste, classification and componenets, physical and chemical characteristics, per capita contribution, sampling and analysis. (8)

**Unit V**

11. Collection and transportation of solid waste: method of collection, equipment used for collection and transportation, transfer stations. (7)
12. Solid waste processing: methods of processing, choice of methods, merits and demerits of various methods. (3)

**UNIT-VI**

13. Composting of waste: method of composting, factors affecting composting (4)
14. Sanitary land filling: site requirements, methods, leachate management. (4)
15. Inceneration: Principles of incineration, types of incinerators, advantages and disadvantages. (2)

**REFERENCE BOOKS**

1. M.N.Rao & H.V.N.Rao, "Air Pollution", Tata McGraw Hill Publishing Co. Ltd.
2. C.S.Rao, "Enviromental Pollution Control Engineering, Wiley Estern Ltd. New Delhi.
3. Stern A.C., "Air pollution" Vol I to X
4. A. D.Bhide & Sunderesan B.B., "Solid Waste Management in Developing countries, INSDOC, New Delhi.
5. Tchobanoglous, "Integrated Solid Waste Management Engineering Principle and Management Issues.
6. K.V.S.G. Murlikrishna "Air Pollution " JTNU, Kakinada

(VII-18)  
**7C05 Elective – I: ADVANCED RCC DESIGN (3L+1T)**

**SECTION A**

**Unit – I**

1. Design of overhead circular service reservoirs. Analysis of staging by cantilever method. Analysis and design for earthquake as per relevant IS codes. Design of foundation- Annular raft, Full raft. (10)

**Unit –II**

2. Design of highway bridges with IRC loading and equivalent UDL. Slab type, Two/Three girder type. (10)

**SECTION B**

**Unit –III**

3. Design of building frames upto two bay/two storey, including design of foundation. Using Limit state Method. (10)

**Unit – IV**

4. Design of cylindrical shells by beam theory, advantages, assumptions, ranges of validity and beam analysis. Design of shells with or without edge beams. (10)

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**7CE06 : Industrial Case study (2P)**

The student is expected to prepare Mini project report on the basis of data collected in summer training of 3 / 4 Weeks and submit detailed report .

**7CE 07 : PROJECT AND SEMINAR (3P)**

This includes preparation of preliminaries for the project work to be under taken in 8<sup>th</sup> Semester.

1. Finalising the title of the Project .
2. Literature Survey
3. Collection of Datas
4. Scope of the project

Each group shall deliver seminar on the work done during the semester. In addition student will deliver one more seminar on the topic finalised by him with the consent of his guide.

**(VII-20)**

8CE01

## SEMESTER – VIII

### ESTIMATING & COSTING

(3L + 1T + 4P)

#### SECTION – A

#### Unit – I

1. General : Importance of the subject, purpose of quantity estimates, Mode and Unit of measurement as per I. S. 1200. Methods and Stages of estimates. Item of a work and Description of an item of work, approximate estimation of Civil Engineering Works [5]
2. Proposal and Development of Project, Nature of contract between owner and Architect / Engineer, Duties and liabilities of Architect / Engineer, Architect's Engineer's normal professional services, Various important terminology required like Work charged establishment, muster roll, contingencies, centage charges, measurement book, overheads etc. [7]

#### Unit – II

3. Quantity and cost estimates :
  - a) Methods of detailed estimates, forms used for detailed estimates, Working out the quantities of various materials required for construction of various Civil Engineering works, Building, Culverts, Hydraulic Structures, Water supply and Sanitary works, road works, retaining walls, water tanks etc.
  - b) Earthwork estimates in road (Including hill roads), canals, mass excavation; mass haul curve.
  - c) Detailed estimates of Steel in RCC works, bar bending Schedule [18]

#### SECTION – B

#### Unit – III

4. Arranging works : P.W.D. as the construction agency, method of carrying out works, arranging contract works, tender and contract planning, tender notice, acceptance of tender, essentials of contract, type of contracts, conditions of contract, contract documents, various schedules in the tender document, measurement and payment to contractor, Indian contract law, and the Engineering contract. Land acquisition act, legal aspects of various contract provisions, arbitration [10]

#### Unit – IV

5. Specifications : Purpose and principles of specifications. Writing types of specifications, writing an developing detailed specifications of Important items. [5]
6. Cost Build up : Purpose and principles, Importance of Schedule of rates (DSR) in Cost Estimate : Factors affecting analysis of rates, information from National Building Organisation, Task work, factors affecting task work. Markets rates, escalation [5]

#### (VIII-01)

#### Unit – V

7. Valuation :- Purpose of valuation, Factors affecting value of property price and cost, market value, potential value, sentimental value, scrap value, reversionary value etc. Real Estate, Guild edged securities, Net and Gross return, tenure of land, Valuation of land. Free hold and lease hold, sinking fund, depreciation, Capitalised value, methods of valuation, differed annuity. Time cost relationship, Valuation tables, rent fixation [7]
8. Cost Accounting : Various methods, classification of cost, direct and indirect charges, distribution of overheads, M. A.S. Account, issue rates and store account [3]

**REFERENCE BOOKS :-**

1. Estimation by Dutta
2. Valuation by Roshan Namavati

**Question paper pattern :-**

Section A : One compulsory question on Estimate for 25 marks and one question is to be solved out of the remaining two questions.

Section B : Three questions are to be solved out of five questions.

**PRACTICAL :**

Term Work : The candidate shall submit 12 experiments in the following:

1. A complete set of contract documents (Including specifications along with a building estimate.
2. Detailed estimates of the following :- (Minimum three)  
Load bearing Structure, R.C.C. framed structures, Hydraulic structures, steel structure, culvert, Water supply & Sanitary work, road work, Water tank.
3. Rate analysis of 10 major items of building and 3 items of road work.
4. Specification of 10 major items of building and 3 items of road work.
5. Site visit to : Study of Schedule of Rates and Comparison with market rates and report by the students.
6. Valuation and rent fixation.
7. earth work of road for 1 km length.
8. Detailed estimate wood work of Doors and windows.
9. Calculation of reinforcement in RCC with bar bending schedule.
10. Study of IS-1200
11. Expert lecture by legal advisor on various legal aspects of contracts and report by the students.
12. Expert lecture by accountant of Construction Department (Preferably Govt.) on various accounting methods, materials management etc. and report by the students.

**Practical examination shall consist of written test and viva voce based on the syllabus and sessional work.**

*(VIII-02)*

**8CE02**

**Transportation Engg. – II**  
**(3L + 1T)**  
**Section – A (Railways)**

**Unit – I**

1. Railways Transportation and its development, Long term operative plans for Indian Railways, Classification of Railway: lines and their track standard. Railway terminology. Railway Administration & Management (2)
2. Traction and tractive Resistance, Hauling capacity and Tractive effort of locomotives, Different Types of Tractions.(2)

**Unit – II**

3. Permanent Way: Alignment Surveys, Requirement, gauges, track section. Coning of wheels, Stresses in railway track. High speed track (4)
4. Rail types of functions, selection for rails, Test on rails wear & defects, corrugations and creeps of rails, Rail joints short and long welded panels, sleepers – function, types, merits and demerits, sleeper density. Ballast cushion, Ballast section Rail fixtures and fasteners (4)

5. Geometric design of railway track, Gauge, Gradients speed, super elevation, can deficiency Negative super elevation, curves, length of transition curves, grade compensations. (3)
6. Points of crossings : Left and right hand turnout, design calculations for turnout & Crossover, railway track functions.(4)

#### Unit –III

7. Station and Yards : Types, functions facilities & equipment.(3)
8. Railway signaling and interlocking : Objects of signaling principles of signaling classification and types of signals, control and movement of trains, track circuiting. Necessity of interlocking & methods and mechanical devices.(4)
9. Railway tract construction, Inspection & modern, techniques of maintenance.(2)
10. Modern Technology related to track & Tradition, Rolling Stock, Signaling & controlling.(2)

(VIII-03)

#### Section – B (Airports)

#### Unit – IV

1. Development of Air Transportation in India : Comparison with other transportation modes. Aircraft components and characteristics, Airport site election. Modern aircrafts.(4)
2. Airport obstructions : Zoning Laws, Imaginary surfaces, Approach and Turning Zone, clear zone, vert. Clearance for Highway & Railway (2)
3. Runway an taxiway design : Windrose, cross wind component, Runway Orientation and configuration. Basic runway length and corrections, runway geometric design standards. Taxiway Layout and geometric design standards. Exit taxiway.(5)

#### Unit – V

4. airport lay out- Airport classification: Terminal Area, Aircraft parking & parking system. Unit terminal concept, Aprons, Hangers, International Airports layouts, phase development Helipads, and Heliports.(3)
5. Visual Aids : airport marking and Lighting for runway, Taxiway and other areas.(2)
6. air traffic control : Need, Network, control aids, Instrumental landing systems Advances in Air-traffic control.(4)

#### Unit – VI

7. Tunnel alignment Tunnel Surveys, Cross section of Highway & Railway.(2)
8. Tunneling methods in Hard Rock and Soft Grounds, Tunnel lining.(5)
9. Drainage, Ventilation and lighting of tunnels.(1)
10. Advances in Tunneling, Tunnel boring Mechanics, Case studies.(2)

(VIII-04)

#### CE 03 ELECTIVE-2

#### Advanced Structural Analysis

(4L + 1T)

#### SECTION –A

#### UNIT-1

1. BEAMSD ON ELASTIC FOUNDATIONS Introduction, Case studies, infinite beams on elastic foundation. Development of Computer program.
2. BEAM CURVED IN PLAN (Statically Determinate Beams Only)  
Introduction, circular beam loaded uniformly and supported on symmetrically placed columns, semicircular Beams, Varandah circular beams.

#### UNIT-II

3. Advanced MATRIX METHOD OF ANALYSIS FOR PLANE Frames, Analysis of Symmetrical & Unsymmetrical plane frames. effect of Shear deformation. Symmetry, Antisymmetry conditions for solving symmetric frames.

#### UNIT-III

4. MATIX METHOD OF ANALYSIS FOR PLANE GRIDS Analysis of Symmetrical & Unsymmetrical plane Grids, space trusses using stiffness approach subjected to member loading (UDL, Conc, Load, Temperature etc.) and Joint loads, Introduction to computer program development. Introduction to MATRIX METHOD OF ANALYSIS FOR Space Structures frames.



## **SECTION-B**

### **UNIT-IV**

INTRODUCTION STRUCTURAL DYNAMICS : Basic concepts, DiAlemberts Principal, equation of Motion of the Basic Dynamic System, Effect of Gravitation force, Influence of Support Excitation, Analysis for free & Forced Damped/undamped vibrations for SDOF only, Transmissibility ratio, Response to Harmonic Loading.

### **UNIT-V**

5. Response to Periodic loading, Response to Impulse loading, Numerical methods, approximate methods for analysis of impulsive loading, response to ground dynamic Loading.

### **UNIT-VI**

6. earthquake Analysis of Structures using IS:1893 : Introduction to Earthquake code, Calculations of earthquake forces on buildings, ESRS, Bridges, Chimneys, retaining Walls using codal coefficient method.

**Note:** Solution is restricted upto three DOF problems and assembly restricted upto 8 DOF problem.

### **BOOKS:**

1. Matrix Method of Structural Analysis – Gere and Weaver
2. Computer Analysis of Structures – Beaufait, Rowen, Headly et al
3. Computer Analysis of Structures – Flemmings
4. Structural Dynamics – Clough & Penzin
5. finite Element Method – Rashtrasant Tukadoji Maharaj Nagpur University D Cook
6. Computational Structural Mechanics, S. Rajasekaran & G. Sankarasubramanian
7. IS:1893 (Revised)

(VIII-05)

## **8CE03 ELECTIVE – II**

### **PAVEMENT DESIGN**

(4L + 1T)

#### **Unit – I**

1. General:  
Structural action of flexible and rigid pavement, characteristics of highway and airfield pavements.(6)
2. Design Parameters:  
Standard Axie load and wheel assemblies for road vehicles under carriage system for aircraft, Type and contact pressure, contact area imprints, Computations of ESWL for flexible and rigid pavements. Load repetitions and distributions of traffic for highway and airfield pavement airport traffic areas. (6)

#### **Unit – II**

3. Materials Characteristics:  
AASHO subgrade soil classification, Group index, CBR, North Dakota cone bearing value, plate load test for K” Marhsal’s method of Bituminous mix design, modulus of rupture and elasticity, poisson’s ratio & coefficient of thermal expansion of concrte, layer equivalent concepts.(8)
4. Analysis of Flexible and Rigid Pavements:  
Stress, Strain deflection analysis for single, two three and multi layered flexible pavement systems stress and deflections for rigid pavements due to load and temperature, influence Charts, ultimate load analysis joints.(10)

#### **Unit – III**

5. Highway Pavement Design:  
(a) Flexible : North Dakota cone, Group index, CBR, IRC-37, Brumister, Triaxia (Kansas), AASHO method of design.

- (b) RIGID IRC-15, P.C.A., AASHO methods of design, Design of joints and reinforcement.(10)
6. Airfield Pavement Design :  
 (a) Flexible : U.S. Corps of Engineering, CBR, FAA, Mcload (Canadian)  
 (b) Rigid PCA, FAA & LCN, ultimate load Analysis yield lines patterns, methods.(5)

#### Unit -IV

7. Pavement Testing and Evaluation : field Density, CBR, plate load Test, Condition surveys and surface evaluation for unevenness, rut depth, profilometers, Bump integrators, Benkalman Beam Deflection Study.(4)
8. Strengthening of Pavements:  
 Design of flexible, composite and rigid overlays for flexible and rigid pavements, Repairs, Maintenance and rehabilitation of pavements.(6)
9. Specifications and Cost Estimates:  
 Review of IRC/MOST/ICAO/IAAI specification and standards for highway and airfield constructions, Cost evaluation and comparative study.(2)
10. Pavement Systems Management : Systems management, case studies of Highway and airfield pavement projects.(2)

(VIII-06)

### 8CE03 ELECTIVE – II

#### WATER POWER ENGINEERING

(4L + 1T)

#### SECTION –A

##### UNIT-1

1. INTRODUCTION : (05)  
 Sources of energy; Importance of water power; Estimate of water power potential; Primary & secondary power, Load factor; load curve.
2. TYPES OF HYDROPOWER PLANT : (06)  
 Low & high head; Run-of-river plant; valley dam; Pumped storage plant; Reservoir plant. Plants diversion channel: High head diversion pumped storage underground; General description of layout; Topographic requirements of each of above.

##### UNIT-II

3. PENSTOCKS: (04) General classification; Design criterion: Economic diameter, Anchorage's accessories.
4. Water Hammer : (05) Meaning; Equation for uniform diameter penstock; Use of Allievi's chart.

##### UNIT-III

5. SURGE TANKS : (10) Types; Functions; Locations; Hydraulic design & stability of surge tanks.

#### SECTION –B

##### UNIT-IV

6. INTAKES : (05) Types; Locations; Trash rack & other components; Control gates; Emergency gates.
7. HYDRAULIC CHANNEL FORBAY : (05) General principles of alignment and balancing tank.

##### UNIT-V

8. TURBINES : (10)  
 types; Hydraulic features ; Size; General description and layouts; Specific speed; Choices; approximate costs.

**UNIT-VI**

9. **POOWER HOUSES: (04)**  
Types; General layout and approximate dimensions.
10. **NON CONVENTIONAL SOURCES OF ENERGY : (05)**  
Tidal power, Wind power; Geothermal power; Solar power; Elementary principles & description; Application of Water power in drilling & blasting of rocks.

**Recommended books:**

1. Water power engineering - M.M. Deshmukh

(VIII-07)

**8CE03 ELECTIVE – II****EARTH & EARTH RETAINING STRUCTURES**

(4L + 1T)

**SECTION –A****UNIT-I:****1. EARTH PRESSURE ON RETAINIGN WALLS**

Rankine's & Coloumb's earth pressure theories, Poncelet's and Culmann's graphical constructions for active and passive pressures. Effects of wall movement, wall friction, type if slip surface, wall angle, backfill slope angle, surcharge & line loads on lateral earth pressure. Direction & point of earth force application -----(8)

**UNIT-II****2. STABILITY OF EARTH RETAINING STRUCTURES:**

Types of walls: gravity, cantilever walls, walls with counter forts and relief shelves, their typical dimensional details. Stability requirements for overturning, sliding, bearing capacity failure; overall stability against shear failure in backfill & foundation soil; application of geosynthetics in earth retaining structures . -----(5)

**UNIT-III:****3. SHEET PILE RETAINIGN STRUCTURES:**

Sheet piles walls bulk heads. Types of sheet piles, constructional features cantilever & anchored walls, their suitability. Analysis for design of cantilever walls in cohesionless and cohesive soils, approximate analysis, Analysis for anchored sheet pile walls with free end & fixed end support condition. Blum's criteria Dezdman and anchors: location and design principles (8)

**SECTION –B****UNIT-IV:****4. COMPACTED EMBANKMENTS:**

Compassion control in field compaction, consideration of placement moisture content during field compaction, over compaction, effects of compactive effect on compaction of clayey and sandy soil, effects of lifts in deep compaction, correction for excluded grain sizes in laboratory compaction Tests Theories of compaction: water film and lubrication concept, microstructure concept ----(8)

**UNIT-V:****5. STABILITY OF SLOPES:**

Friction circle methods, factors of safety, stability number and use of stability chart, base failure stability of earthdam slopes, for steady seepage and sudden draw down, approximate analysis for plain slip surface, bishop's method for slope stability ----(6)

(VIII-08)

**UNIT-VI:****6. COFFERDAMS:**

Types, suitability, stability analysis of cellular and diaphragm type cofferdams, TVA method, interlocked stresses. (4)

**7. BRACED CUTS:**

Sheeting and bracing systems in shallow and deep vertical cuts in different types of soils, Failure modes lateral pressure distribution on sheeting, stability of bottom of excavation. (3)

**BOOKS:**

1. Arora K. R.: Soil mechanic & foundation Engineering.
2. Punmia B.C.: Soil mechanics & foundation.
3. Gopal Ranjan & Rad : Basic & Applied mechanics.
4. Puruthottarn Raj: Geotechnical Engineering.
5. B. M. Das: Principal of Geotechnical Engineering.
6. Winterkom H. F. & Farg H. Foundation Engineering Hard Book.

(VIII-09)

**8CE03 ELECTIVE – II**

**WATER TRANSMISSION AND DISTRIBUTION SYSTEM  
(4L + 1T)**

**SECTION –A****Unit - I**

1. General Hydraulic Principles : Frictional head loss in pipes, different formulae, minor head loss in pipes, equivalent pipe (4).
2. Reservoir, Pumps and Values :  
Impounding reservoir, Service and balancing reservoirs, Three reservoir system, Multi-reservoir system, Pumps and pump combinations, Valves-their types, analysis of reservoir system with checks valves and pressure reducing valves.(8)

**Unit – II**

3. Analysis of Water Distribution Networks:  
Types and parameters, Parameter relationship, Formulation of equations, Analysis of network using Hardy Cross method, Newton Raphson method and linear theory method, Introduction of gradient method, Introduction of Dynamic analysis. (13).

**Unit – III**

4. Node Flow Analysis (NFA):  
Difference between Node Head and Node Flow Analysis, Necessity of NFA, Bhavé's approach-Node classification, node category compatibility, NFA theory. Introduction to other NFA methods – Germanopolus approach, Wagner et. al. approach, Gupta and Bhavé's approach. (12)

**SECTION –B****Unit – IV**

5. Reservoir capacity : Estimation of minimum required reservoir capacity using graphical and analytical method . (7)
6. Design of pumping main : Optimal design of pumping main considering pipe diameter as continuous and discrete variable.(6)

**Unit - V**

7. Design of Water Distribution Networks : Design of single source branching networks using critical path method, Number of branching configuration of looped networks using Graph theory principles, selection of branching configuration using path concept and minimum spanning tree concept. Design of Single source looped networks using critical path method. (13)

(VIII-10)

**Unit - VI**

- Optimal Design Water Distribution Networks : Cost Head Loss Ratio (CHR) method – CHR criterion, Problem formulation, CHR methodology ( for single source branching networks). Linear programming formulation and solution using Simplex Method, Introduction of Non-Linear Programming based approaches.(7)

**Reference Books :**

- Jeppaon R. W. (19777), “ Analysis of Flow in Pipe Networks” Ann Arbor Science. Ann Arbor Michigan, USA.
- Walski T.M. (1984), “ Analysis of Water Distribution System” Van Nostrand Reinhold co. Net York, N.Y., USA
- Bhave P. R. (1991), “ Analysis of flow in water distribution networks” Technomic Publishing CO. Lancaster, Pennsylvania, USA.

*(VIII-11)***8CE03 ELECTIVE – II****ADVANCE ENGINEERING GEOLOGY****(4L + 1T)*****SECTION –A*****Rock Mechanics****Unit – I**

- Strength and failure of rocks, Creep behavior, elastic constants and rheological models, dynamic Properties of rocks. (8)

**Unit – II**

- Methods of rock exploration : Drilling, geophysical exploration; gravity, magnetic and seismic methods, in-situ tests, deformability shear tests, strength tests. (8)

**Geo-hydrology****Unit – III**

- groundwater and well Hydraulics – Various Field (Pumping and other) methods for determination of permeability, storage capacity, transmissivity, specific capacity, safe yield. Groundwater trends and fluctuations. (12)

***SECTION –B*****Unit – IV**

- Groundwater Modeling : Surface and sub-surface investigations of groundwater. (Including Geological remote sensing and geophysical methods); Artificial recharge of ground-water Management of groundwater. (12).

**Environmental Geology****Unit – V**

- Land use and land planning pollution of surface and groundwater; waste disposal site location for solid and liquid wastes.(8)

**Unit – VI**

- Geological Hazards: With emphasis on earthquakes, Stability of slopes and landslides, prediction, prevention and rehabilitation (8)

### Text Books

1. Crynine X Indd: Engineering geology.
2. H.M. Rughunath : Groundwater Hydrology.
3. K. Todd : Groundwater Hydrology.
4. T. Lundgear : Environmental Geology

(VIII-12)

### 8C04 ELECTIVE – III

#### ADVANCED STEEL DESIGN (3L + 1T + 2D)

#### SECTION –A

##### UNIT – 1

1. **Gantry Girders**  
Cranes – Hand operated, Electrically operated overhead Design considerations, Crane girder and Gantry girder design. (6)
2. **Industrial building frames**
  - i. Upto two bay single storeyed, foundations, connections, detailing of steel connections.
  - ii. North light trusses and lattice girders for industrial buildings. (9)

##### UNIT – II

3. **Bridges**  
Types of bridges foot bridge, road bridge, railway bridge.  
Rolled beam bridges, plate girder bridges, trussed bridge, through type, deck type bridges.  
Weight of bridge truss by empirical formulae.  
Loading on foot ways, IRC loading, loading on railway bridges.  
Design of a foot bridge, design of components of railway and road bridges. (10)
4. **Bearings**  
Types of bearings, bearing parks, design of rocker and roller bearings.(5).

#### SECTION –B

##### UNIT - III

5. **Storage Vessels:**  
General concepts, design of bunkers, Circular and rectangular, including oil tanks.(10)
6. **Open web sections**  
Introduction, design of open web sections.

(VIII-13)

##### UNIT -IV

7. **Composite construction. General Concepts.**  
Properties, steel – concrete composite design of encased beams, columns, shear connectors.
8. Advance welding technique and approximate estimates.

**Practicals:**

Minimum two design assignments including detailed structure drawings on A-2 size sheets based on the above topics.

(VIII-14)

**8C04 ELECTIVE – III****PRESSTRESSED CONCRETE**

(3L + 1T + 2D)

Use of IS – 1343 is expected for this course, and will be allowed in the examination.

**SECTION –A****Unit – 1**

1. Losses in prestress in continuous beams.
2. Partial prestressing
3. Analysis and design of End Blocks as per IS 1343 Method. (Only comparative study with the other methods is expected.)
4. Use of untensioned reinforcement
5. Types of prestressed concrete structures – Type - I, II and III

**Unit – II**

6. Structural design of prestressed concrete beams by Limit state method, including Limit state design criteria for prestressed concrete members.
7. Deflections of prestressed concrete beams.
8. Behaviour of unbonded and bonded prestressed concrete beams.

**Unit – III**

9. Shear and torsional resistance of the prestressed concrete members.
10. composite construction of prestressed concrete structures and in-situ concrete, analysis and design. Differential shrinkage, deflection, flexural strength, serviceability (Limit state) of the composite sections.

**SECTION –B****Unit – IV**

11. Statically Indeterminate structures, Continuous beams, primary and secondary moment, transformation profile, concordant profile.
12. Flexibility Influence coefficient, Analysis of single-storey, single-bay fixed portal frame.

**Unit – V**

13. Analysis of design of circular water tank, fixed, hinged and sliding base at the bottom, use of IS 3370.
14. Design of prestressed concrete poles.

(VIII-15)

**Unit – VI**

15. Special problems in prestressed concrete structures like stress corrosion, fatigue, dynamic behaviour of prestressed concrete beams, behaviour of prestressed concrete structures under fire.
16. Introduction to prestressed concrete bridges, pavement, one way, two way and grid floor. Rehabilitation of structures using prestressed concrete.

**Practicals:**

A minimum of four design assignments containing the detailed calculation and structural drawings.

Any four of the following:

1. Single span rectangular beam.
2. Continuous beam.
3. Circular water tank
4. Prestressed concrete pole.
5. Two way slab.

**Books :**

1. PRESTRESSED CONCRETE by Dr. N. Krishna Raju.
2. PRESTRESSED CONCRETE by Dr. TY Lin.

(VIII-16)

**8CE04: ELECTIVE – III****ADVANCED GEOTECHNICAL ENGINEERING  
(3L + 1T + 2P)****SECTION –A****UNIT – 1:**

1. Physico – chemical properties of clays:  
Origin and classification of clay minerals, lattice structures and characteristics of kaolinite, illite and montmorillonite, isomorphic substitutions, specific surface, adsorption of ions & dipole water molecules on clay particles, base exchange & its engineering significance, formation & characteristics of flocculated dispersed clay structures, sensitivity, thixotropy thixotropic fluids. Swelling – shrinking of clays' identification of clay minerals by x-ray diffraction and DTA methods. (8)

**Unit – II:****2. EXPANSIVE SOILS:**

Mechanism of swelling, recognition of expansive soil. Free swell indices, ground heave, swelling pressure & swelling potential, factors affecting expansivity and swelling pressure of soil, properties and uses of bentonite slurry, design approaches for foundations in swelling soil, introduction to CNS technique, Underreamed piles, functions construction & load capacity of single and double underreamed piles ....(8)

**Unit – III:****3. DRAINAGE & DEWATERING:**

Purpose, various methods, well point systems, their suitability, flow towards slots from line source, concept of electroosmosis.....(5)

**SECTION –B****Unit – IV:****4. CONSOLIDATION:**

2-D consolidation theory, application to consolidation due to sand drains, constructional features and design of sand drain installation. Secondary consolidation, phenomenon & estimation of secondary consolidation settlement. Over consolidated soils, over consolidation ratio, Schmertmann's method for determination of Preconsolidated pressure field consolidation curve. ....(7)

**Unit – V:****5. INTRODUCTION TO ROCK MECHANICS:**

Rock as engineering material, index properties of rock, RQD, point load strength, slaking & durability, sonic velocity, Rock classifications for engineering purposes rock mass rating, uniaxial strength behavior of rocks, tensile strength test, insitu stresses in rocks, elastic properties of rocks.(7)

**(VIII-17)****Unit – VI:****6. DRILLED PIERS & CAISSONS:**

Uses, classification & methods of construction, safety requirements in pneumatic caissons, floating stability of box caisson Well foundation – Use & constructional features, sinking of well, tilt and shift, their rectification, depth of well, grip length, Terzaghis method for stability analysis of well based on ultimate resistance, principles of design of components of well ....(7)

**Recommended Books:**

1. Arora K. R. : Soil Mechanics and Foundation Engg.
2. Punmia B.C. : Soil Mechanics and Foundation Engg.
- Purushottam Raj : Geotechnical Engg.
- 1 Ranjan and Rao : Basic & Applied Soil Mechanics.



**PRACTICALS:**

(A) Any three of the following laboratory practicals:

1. Determination of swelling pressure of soil.
2. Determination of swelling potential of soil.
3. Determination of tensile strength of rock by Brazilian test. .
4. Determination of stress-strain nature, compressive strength and elastic modulus of rock from uniaxial Compression test.
5. Determination of consolidation property parameters.

(B) Any two design assignments:

1. Design of sand drain installation.
2. Design of underreamed pile foundation.
3. Stability analysis of well foundation.

*(VIII – 18)***8C04: ELECTIVE – III****COMPUTER GRAPHICS AND APPLICATIONS****(3L + 1T + 2P)****Unit – 1**

1. Graphical Input, and communications, Display Devices, Scan Conversion: Graphical input devices, storage devices, communication devices, display devices, scan-converting a point, straight line, a circle, an ellipse, arc, sector, a rectangle, Region filling, side effects of a scan conversion.

**Unit – II**

2. Two dimensional Graphic Transformations, View Transformation and clipping: Geometric transformation, Coordinate Transformation. Composite transformation. Instance transformation, Viewing Transformation, Clipping and shielding.

**Unit – III**

3. Three dimensional Graphic Transformation: Geometric transformation, Coordinate Transformation, Composite transformation and matrix concatenation, Instance transformation, three dimensional viewing, Clipping, view transformation

**Unit – IV**

4. Geometric Forms and Models, Hidden Surfaces : Simple geometric forms, Wireframe models, Curved surfaces, Curve design, Transforming curves & surfaces, Hidden surfaces, Depth buffer Algorithm, Scan-line Algorithm, The painter's Algorithm, Subdivision Algorithm, Hidden-line Elimination.

**Unit – V**

5. Computer Graphics applications Using OPENGL / Windows Graphic routines.

**Unit – VI**

6. Computer Graphic Applications for Civil engineering Problems.

**Practicals :-** Minimum TEN practicals based on syllabus.**References**

1. Theory and Problems in COMPUTER GRAPHICS- Roy A Plastock, Gordon Kelly
2. Computer Graphics – A Programming Approach by Steven Harrington
3. Computer Graphics by Donald Heam & M. P. Baker

*(VIII – 19)*

**8CE04: ELECTIVE – III****WATER AND WASTE WATER TREATMENT (3L +1T+2P)****SECTION – A****Unit – 1**

1. Objective of water treatment, unit operation and unit processes, treatment flow sheet, site selection for water treatment plant.(3)
2. Aeration : Objectives of aeration, types of aerators, design of cascade aerator, Gas transfer, two film theory. (5)

**Unit – II**

3. Coagulation – Flocculation: Theory of coagulation, objectives, types of rapid and slow mixing devices (hydraulic and mechanical), design of flash mixer, design of flocculator (hydraulic and mechanical), factors affecting coagulation and flocculation, nature and types of chemical coagulants used in water treatment, coagulant and flocculent aids, (6)
4. Sedimentation : Theory of sedimentation, factors affecting, types of settling, analysis of discrete and flocculent settling, design of sedimentation tank and clariflocculators. (6)

**Unit – III**

5. Filtration: Mechanism of filtration, types of filters, design of rapid sand filters, filter media specifications, preparation of filter sand from stock sand, problems in filtration.
6. Disinfection : Methods of disinfection, kinetics of disinfection types of disinfectants, chlorination, method of chlorination ( Breakpoint chlorination), factors affecting efficiency of chlorination. (3)
7. Iron and manganese removal, defluorination. (1)
8. Recent development in water treatment (1).

**SECTION - B****Unit – IV**

9. Physical and chemical characteristics of waste water, DO, BOD, COD, determination of BOD rate constant. (4)
10. Disposal of sewage by dilution and by land disposal, Streeter- Phelps's equation. (6)

*(VIII – 20)***Unit – V**

11. Treatment Methods: Waste water treatment flow sheet, preliminary, primary and secondary method of treatment, design of screen, grit chamber and primary settling tank. (10)

**Unit – VI**

12. Biological unit processes : Principle of biological treatment processes, design parameters of activated sludge process, trickling filters, aerated lagoons and stabilization ponds. (5)
13. Sludge treatment, aerobic and anaerobic digestion and sludge drying beds (Excluding design). (3)
14. Recent development in waste water treatment. (1)

**Practical :**

- A) Min. 5 Experiment.
  - 1) Determination of sulphates.
  - 2) Determination of chlorides
  - 3) Residual available chlorination and chlorine demand.
  - 4) Determination of Biochemical oxygen demand
  - 5) Determination of chemical oxygen demand.
  - 6) Jar test
  - 7) Effective size and uniformity coefficient of filter sand.
  - 8) Bacteriological test. (MPN Test)
  - 9) Design of individual unit of water or waste water treatment.

Design of individual unit of water or waste water treatment.

**Reference Book:**

1. S. K. Garg "environmental Engineering "Vol I & Vol. II
2. B. C. Punmia " Environmental Engineering " Vol. I & Vol. II
3. Mtcalf & Eddy " Waste Water Treatment disposal & reuse".

(VIII – 21)

**8CE04: ELECTIVE – III  
APPLIED REMOTE SENSING AND GIS (3L +1T+2P)**

- I. Definition and Scope of Remote Sensing : Electromagnetic Energy and its wavelength. Remote Sensing System, Sensors and Scanners, Resolution of Sensors, multi-spectral, Thermal and Radar Scanners. Radiometers spectral response curve and spectral signatures. (10)
- II. Elements of Sensing Systems : Terrestrial, airborne and space borne platforms, Sun-synchronous and Geo-stationary satellites, advantages and Disadvantages. Various earth Resources satellites, Indian Remote Sensing Program. Remote Sending Data Products and their types: Analogue and Digital Data formats. Thermal and Radar Imageries. FCC. (10)
- III. Interpretation Techniques : Elements of Interpretation and methods Interpretation key, interpretation instruments, Relief displacement and vertical exaggeration. Determination and calculation of elevation from RS data. (8)
- IV. Digital Image processing: Image rectification and restoration, Image enhancements-contrast manipulations, spatial feature manipulation, multi-image manipulation: Image classification Supervised & Unsupervised classifications, accuracy assessments and data merging. (8)
- V. Geographical Information System : Raster and Vector data, concepts and basic characteristics of vectorization, Topology generation, attribute data attachment, editing and analysis. (10)
- VI. Application : Integrated approach of RS and GIS application: Application in Geological investigations, water resources management, environmental studies – ELA based studies, Land use planning, soil studies and transportation planning. Application in Civil Engineering projects – Dams and bridges site investigations, Landslide studies. (12).

**List of Practical**

RS Data Formats and their study : Analogue and Digital Data Products.

1. Digital Image Processing : Registration, Enhancement and digital Classifications.
2. Case studies in Water resource (Surface, Groundwater), environmental geology, engineering projects.
3. Calculations on RS data : Elevation, spatial attributes.
4. GIS; Vector data generation, data attachments and data analysis.

(VIII – 22)

**8CE05 : PROJECT : (6P)**

Minimum two presentations on the work done shall be before approval of draft copy by the respective guides.

(VIII-23)

Civil Engg-

(7th sem)

Scheme of Teaching & Evaluation of 7th SEM Engineering

VII Semester

Sl. No	Code	Name of Subject	Teaching Scheme (Clock Hours/Week)			Total	Assessment of Marks for Theory		Assessment of Marks for Practical		Total	Min. for Passing	No. of Papers
			L	T	P/D		Figure	CA	Total	Practical			
✓	AST01	Structural Analysis-II	4	1	-	5	80	20	100	50	50	40	3
✓	AST02	Advanced Concrete Structures	3	1	-	4	80	20	100	50	50	40	3
✓	ICEE05	Construction Engineering Maintenance & Rehabilitation of	3	1	-	4	80	20	100	50	50	40	3
✓	ICEE05	Civil Engineering Seminars	3	1	-	4	80	20	100	50	50	40	3
✓	ICEE05	Elective - I ?	3	1	-	4	80	20	100	50	50	40	3
✓	ICEE06	Industrial Case Study	-	-	2	2	-	-	-	-	-	-	-
✓	ICEE07	Project & Seminar	-	-	3	3	-	-	-	-	-	-	-
Total Credits : 18 + (5+13) = 25			16	5	13	34	880	100	500	125	175	300	-
Total Marks : 500 + 300 = 800													

8th sem.

VIII Semester

Sl. No	Code	Name of Subject	Teaching Scheme (Clock Hours/Week)			Total	Assessment of Marks for Theory		Assessment of Marks for Practical		Total	Min. for Passing	No. of Papers
			L	T	P/D		Figure	CA	Total	Practical			
✓	ICEE01	Forming & Casting	3	1	-	4	80	20	100	50	50	40	4
✓	ICEE02	Transportation Engineering-II	3	1	-	4	80	20	100	50	50	40	4
✓	ICEE03	Elective - II ?	4	1	-	5	80	20	100	50	50	40	3
✓	ICEE04	Elective - II ?	3	1	-	4	80	20	100	50	50	40	3
✓	ICEE05	Project	-	-	6	6	-	-	-	-	-	-	-
Total Credits : 13 + (4+12) = 21			13	4	12	29	480	80	400	150	150	300	-
Total Marks : 25 + 26 + 5 + 25 + 24 + 25 + 11 + 14 + 6 + 5													
Total Marks : 400 + 300 = 700													