



Shivaji University, Kolhapur
(Introduced from June, 2004)
T.E. (Civil/ Environmental) Engineering
Part - I

Sr. No	Subject	Teaching / Week					Examination Scheme				
		L.	Pr.	Tu	Dr.	Total	Theory Paper Work	Term Work			
								TW	POE	OE	Total
1	Design of Steel Structures	3	2	-	-	5	100	25	-	-	125
2	Geotechnical Engg-I	3	2	-	-	5	100	25	25	-	150
3	Building Planning & Design	3	-	-	4	7	100#	25	--	25	150
4	Concrete Technology	3	2	-	-	5	100	25	--	--	125
5	Environmental Engg.-I	3	2	-	-	5	100	25	25	-	150
6	Engineering Management-I	3	-	-	-	3	100	-	-	-	100
	Total	18	8	-	4	30	600	125	50	25	800

Note : # Theory paper of Four Hours Duration.

T.E. (Civil/ Environmental) Engineering

Part - II

Sr. No	Subject	Teaching / Week					Examination Scheme				
		L.	Pr.	Tu	Dr.	Total	Theory Paper Work	Term Work			
								TW	POE	OE	Total
1	Structural Mechanics-III	3	-	1	-	4	100	-	-	-	100
2	Geotechnical Engg.-II	3	2	1	-	6	100	50	-	-	150
3	Transportation Engg-I	3	2	-	-	5	100	25	-	25	150
4	Engineering Management-II	4	2	-	-	6	100	25	-	25	150
5	Environmental Engineering-II	3	2	-	-	5	100	50	-	-	150
6	Structural Design & Drawing -I	-	-	-	4	4	-	50	-	50	100
	Total	16	8	2	4	30	500	200	-	100	800
		Total of Part I and Part-II									1600

★★★★★ B+

Shivaji University, Kolhapur
T.E. (Civil/ Environmental) Engineering Part-I
1 Design of Steel Structures

Teaching Scheme:

Lecture: 3 hours per week

Practical: 2 hours per week

Examination scheme:

Theory paper: 100 marks

Term Work: 25 marks

SECTION I

UNIT 1: Introduction to Design of Steel Structures (02)

Advantages & Disadvantages of steel structures, permissible stresses, factor of safety, Methods of design, Types of connections, various types of standard rolled sections, Types of loads and load combinations.

UNIT 2: Design of Welded & Bolted Connections (05)

Types of welds, failure of welded joints, Throat thickness, permissible stresses, analysis of axially & eccentrically loaded connections (subjected to bending & torsion), Type of bolts, bolt, nut & washer assembly, stresses in bolts and design.

UNIT 3: Tension Members (04)

Common sections, net effective area of angle, tees and flats. Load carrying capacity, connection of section to gusset using weld / bolts. Design of tension splice.

UNIT 4: Compression Members- Struts (04)

Common sections used in trusses, effective length and slenderness ratio, permissible stresses, Load carrying capacity, connection of section to gusset using weld / bolt.

UNIT 5: Beams- (06)

Laterally supported & unsupported beams, design of simple beam, built up beams using flange plates. Curtailment of flange plates, web buckling & web crippling. Secondary and main beam arrangement, beam to beam connections.

SECTION II

UNIT 6: Gantry Girder- (03)

Forces acting on a gantry girder, commonly used sections, design of gantry girder as laterally unsupported beam, connection details.

UNIT 7: Roof Trusses- (05)

Various components of an industrial shed, Types of trusses, load calculation and combination, design of purlins, design of members, Design of hinge & roller supports.

UNIT 8: Columns (05)

Simple and built up section, lacing, battening, column subjected to axial force and bending moment, column splices.

UNIT 9: Column Bases (05)

Slab base, Gusseted base and moment resisting bases, Design of anchor bolts, design of pedestal.

UNIT 10: Introduction to Plastic Analysis (03)

Plastic moment, moment curvature relationship, plastic hinges, theorems of plastic analysis, mechanisms, application of virtual work method to beams.

Note:

Use of IS 800, IS 875, IS: Handbook No.1 for steel section and steel table is permitted for theory examinations.

TERMWORK

Term work shall consist of at least eight assignments based on theoretical course above.

RECOMMENDED BOOKS

1. Design of Steel Structures by S. K. Duggal, Tata Mc Graw Hill publishing company Ltd., New Delhi.
2. Design of Steel Structures, Vol.I & Vol.II by Ram Chandra, Standard Book House, New Delhi.
3. Design of Steel Structures, by Dayaratnam, Wheeler Publishing, New Delhi.
4. Design of Steel Structures, by B.C.Punmia, Jain & Jain Laxmi Publication, New Delhi.
5. Design of Steel Structures, by A.S.Arya and J.L.Ajamani, Nemchand and Bros., Roorkee.
6. Design of Steel Structures, by Vazirani & Ratwani.
7. Design of Steel Structures by- E.H.Gaylord and C.N. Gaylord, Mc Graw Hill, New York.
8. Design in Structural Steel Vol.-I by-J.E.Lothers, Prentice Hall New Jersey.
9. Steel Structures: Design and Behaviour by C.G.Salmon and J.E.Johnson, Harper and Row, New York.

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T.E. (CIVIL ENGINEERING) Part – I

2. Geotechnical Engineering –I

Teaching Scheme
Lectures: 3Hrs/week
Practical: 2Hrs/week

Examination Scheme
Theory paper: 100 Marks
Term work: 25 Marks
Oral exam: 25 Marks

Section I

Unit I (8 Lectures)

Introduction: Definition of soil and soil engineering, Application areas of soil mechanics, 3 Phase soil system, Soil moisture.

Index properties of soil: Different unit weights of soil, and their determination, unit weight of solids, unit weights of soil mass viz. saturated unit weight, submerged unit weight, dry unit weight, method for determination of field density viz. sand replacement and core cutter.

Specific Gravity determination methods void ratio and porosity, degree of saturation, Inter relation between weight volume state, density index.

Soil Consistency: Atterberg's limits and their significance

Soil Classification: Soil classification based on particle size and constituency, I.S. classification system of soils. Soil structure and fabric.

Effective Stress Concept: Terzaghi's effective stress concept, equilibrium water content, frost action.

Unit II (6 Lectures)

Flow of water through soil: Permeability –head, gradient and potential, Darcy's law and its validity. Factors affecting permeability, Field and laboratory methods of determining permeability. Seepage pressure, quick sand condition, Derivation of Laplace equation. Flow net, it's characteristics, it's application, construction of flow net, piping phenomenon.

Unit III (7 Lectures)

Shear Strength: Concept of shear, Coulomb's theory and failure envelope, Principle stress, stress analysis (Total stress approach and effective stress approach), representation of stresses on Mohr's circle for different types of soil such as cohesive and cohesionless, saturated and partly saturated soil etc. Application of shear stress parameters in the field.

Different types of shear tests: Unconsolidated undrained, Consolidated undrained and consolidated drained choice of the type of test, box shear test, triaxial compression test with pore pressure and volume change measurement, unconfined compression test, vane shear test.

Unit IV (5 Lectures)

Compaction: Theory of compaction, factors influencing compaction, compacted density, Laboratory Standard and modified compaction test. Method and measurement of field compaction, Field compaction control.

Unit V (7 Lectures)

Compressibility and consolidation:

Compressibility: Definition, compressibility of laterally confined soil, compression of sand and clay, e-p and e-log p curve, compression index.

Consolidation: Terzaghi's theory of one dimensional consolidation, consolidation test, determination of coefficient of consolidation, degree of consolidation, relevance of one dimensional consolidation to field condition, time factor.

Unit VII (6 Lectures)

Earth pressure theory: Concept, Area of application, earth pressure at rest, active and passive condition.

Rankines and Coulomb's theory of earth pressure. Graphical solution-Trial wedge methods, Culman's method – Rebhan's construction and modification.

Critical depth of open cut in cohesive soil.

Unit VIII (2 Lectures)

Soil reinforcement: Type of Geosynthetic material and different application in civil engineering.

Practicals

1. Specific gravity determination of coarse and fine grained soil
2. Particle size distribution-Mechanical sieve analysis, wet sieve analysis.
3. Determination of Atterberg's consistency limit.
4. Permeability- Determination of coefficient of permeability.
5. Field density determination.
6. Direct shear box test.
7. Procter compaction test.
8. Triaxial test.
9. Unconfined compression test.
10. One dimensional consolidation test.

Recommended Books:

1. "Text book of soil mechanics in theory and practice" by Dr. Alam Singh(Asian Publishing House, Bombay)
2. "Soil mechanics and Foundation engineering" by V.N.S.Murthy.(U.B.S.Publishers and distributors New Delhi)
3. "Soil mechanics and Foundation engineering" by B.S.Punmia.(A Saurabh and Company Pvt. Ltd., Madras)
4. "Geotechnical Engineering" by P.Purushottam Raj.(Tata Mcgraw Hill company Ltd.New Delhi)
5. "Fundamentals of Soil mechanics" by D.W. Taylor.
6. "Soil mechanics" by Terzaghi and Peak.(John Willey and Sons, New-York)
7. "Principal of soil mechanics" by R. F. Scott.
8. "Soil Testing" by T.W. Lambe.(Willey Eastern Ltd., New Delhi)
9. "Geotechnical Engineering" by B. J. Kasamalkar.(Pune Vidyarthi Griha Prakashan Pune)
10. Relevant I.S. Code on Geotechnical Testing.

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T.E. (Civil/Environmental) Part-I

3. BUILDING PLANNING & DESIGN

Teaching Scheme:

Lectures: 3 Hours /Week

Drawings: 4 Hours/week

Examination Scheme:

Theory Paper: 100 Marks

Term work: 25 Marks

Oral Exam.: 25 Marks

SECTION – I

Unit 1:

Dimensions & space requirement in relation to body measurements, space design for passage between walls, service access, stair, ramps, elevators.

(lectures—1)

Unit 2:

Planning and Design, site selection, site layout for various types of building such as:

a) Educational buildings: Younger age range, middle age range, older age range, School for mentally retarded.

b) Building for health- Sanitorium, Hospitals.

c) Assembly buildings- Recreational Halls, Community halls, Cinema theatres, Gymnasiums, Restaurant, Temples, Dance halls, Clubs.

d) Business and Mercantile buildings- Shops, Banks, Markets and Departmental stores.

e) Industrial buildings- Factories, Warehouse.

f) Office and other buildings- Post offices, Administrative buildings etc.

g) Buildings for transportation- Bus stations, Truck terminals.

h) Computer centers, service centers for communication and electronic media.

(Lectures—16)

Unit 3:

Elements of perspective drawings, parallel perspective and angular perspective.

(Lectures—5)

SECTION – II

Unit 4.

Computer aided design and drawing, development of plan, elevation, section and perspective drawing. (Lectures—4)

Unit 5.

a) Acoustics - Sound frequency, wave length, intensity, sound decibel ratings, absorption of sound- various materials, Sabine's formula, optimum reverberation time, conditions for good acoustics, effect of reflectors, flat ceiling and curved ceiling, design of an auditorium, defects in auditorium and remedies, acoustics of various buildings such as conference halls, class rooms, broadcasting room etc.

b) Sound insulation: Acceptable noise levels- Noise prevention at its source, transmission of noise, noise control- general considerations.

(Lectures—8)

Unit 6.

Fire resisting structures- Fire protection precautions, confining of fire, fire hazards, characteristics of fire resisting materials, various building materials and their resistance for fire, fire resisting construction, fire load – normal and abnormal, distribution of fire load, grading of structural elements and buildings, fire escape.

(Lectures—5)

Unit 7.

(a) The nature of architecture- Definition and scope of study.

(b) The aesthetic component of building, terms such as mass, space, proportion, symmetry, balance, contrast, pattern..

Integration of aesthetics and function, introduction to concept of interior designing and landscaping.

(Lectures—2)

TERM WORK:

I) Planning and designing of a building project for which minimum 5 imperial size drawings shall be prepared covering scope of 1) Municipal drawing, 2) Layout plan, 3) Plan giving details of water supply, drainage, electrification, furniture layout etc. 4) Elevation treatment.

II) Imperial size sheet/s for perspective view of the buildings planned above.

III) Two alternative line plans on Graph paper of at least five remaining types of buildings (not covered in I) with merits and demerits.

IV) Two exercises on parallel and angular perspective of simple objects on half imperial sheets.

V) Report for the building project stated in I, including necessary sketches and design details.

VI) Visit to a building complex and a report based on that.

VII) One exercise of preparing a plan and elevation on CAD.

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T.E. (CIVIL/ENVIRONMENTAL ENGINEERING) PART I

4. CONCRETE TECHNOLOGY

Teaching Scheme:

Lectures: 3 hours per week

Practical: 2 hours per week

Examination scheme:

Theory: 100 marks

Term Work: 25 marks

SECTION I

Unit No.1:

Materials for Concrete

(7)

a) Cement – Hot and dry manufacturing process, significance of physical properties of cement such as fineness, consistency test, Initial and final setting time, soundness, compressive strength, specific gravity. Hydration of cement, chemical compounds in cement and their properties. Types of cement- Ordinary Portland, Portland pozzolana, Rapid Hardening Portland Cement, Quick setting cement, Sulphur resisting cement, High Alumina, Low heat, White, Coloured, Oil well, Hydrophobic cement.

b) Aggregates: Physical properties such as sieve analysis and fineness modulus, specific gravity and water absorption, silt content, Bulking of sand, Bulk density, moisture content, Flakiness index, Elongation index, Angularity Number. Mechanical properties such as Crushing, Impact and Abrasion value.

c) Water: Specifications of water to be used for concrete making.

Unit No.2

(5)

Properties of Fresh Concrete -Types of Batching, Mixing, Transportation, placing including pumping and compaction techniques for good quality concrete, Workability of concrete and its measurements, segregation and bleeding, curing of concrete, different methods, methods of measuring Workability, temperature effects on fresh concrete.

Unit No.3

(5)

Admixtures in concrete and construction chemical- Types of admixtures, Plasticizers and superplasticizers and their effects on workability, air entraining agents, accelerators retarders, their effects on proportion of concrete, pozzolanic admixtures, Bonding admixtures, damp-proofing admixtures, construction chemical.

Unit no.4

(5)

Desired properties of concrete, strength, durability & impermeability.

Characteristic strength, compressive, tensile and flexure of concrete, tests on concrete, modulus of elasticity, effect of w/c ratio and admixture on strength properties of concrete. Concrete mixes for different strength as per IS: 456-2000, High strength and high performance concrete. 5

SECTION II

Unit No.5 (3)
Creep and shrinkage of concrete, significance, types of shrinkage and their control, factors affecting creep.

Unit No.6 (6)
Design Mix Concrete, Nominal Mix Concrete, objectives of mix design, factors governing mix design, methods of expressing proportions, ACI method, IS code method, road Note No. 4 method IRC method, trial mixes, Acceptance criteria.

Unit No.7 (6)
Durability of concrete: Minimum & Maximum cement content, strength & durability relationship, volume change in concrete, impact of w/c ratio on durability, permeability, Exposure to different conditions, factors contributing to cracks in concrete, sulphate attack, Alkali aggregate reaction, chloride attack, corrosion of steel (chloride induced).

Unit No.8 (5)
Types of concrete: light weight concrete, polymer concrete, gap graded concrete, no fines concrete, plum concrete, high performance concrete. Quality control of concrete – Factors causing variations, field control, statistical quality control, quality measurement in concrete construction.
Nondestructive testing of concrete-rebound hammer, ultrasonic pulse velocity, corrosion meter, rebar locator, core cutter.

TERM WORK:

Experiments:

Testing of cement

Consistency, fineness, setting time, Specific Gravity, Soundness and strength.

Testing of aggregate

Specific Gravity, sieve analysis, bulking of Fine aggregate, bulk density, flakiness index, elongation index and percentage elongation.

Tests on Concrete

Workability tests- Slump, compaction, Vee-bee, strength tests- compression, flexure, split & tensile.

Effects of Addmixture

Accelerator, Retarder, Super Plasticizer.

Concrete Mix design

Theoretical & experimental

NDT-Rebound Hammer, Ultrasonic Pulse Velocity.

REFERANCE BOOKS:

1. Concrete Technology by Orchard
2. Concrete Technology by Gambhir.
3. Concrete Technology by Shetty.
4. Concrete Technology by Neille.
5. Concrete Technology by Krishnaswamy.
6. I.S. 456 Code.
- 7.I.S. 9013-1978 Accelerated curing.

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T. E. (CIVIL/ENVIRONMENTAL ENGINEERING) PART-II

5. Environmental Engineering-II

Teaching Scheme:
Lectures:3Hrs/Week
Practical:2Hrs/Week

Examination Scheme:
Theory paper : 100 Marks
Term Work : 50 Marks

Section-I

Unit 1

Components of wastewater flows, wastewater sources and flow rate, Variations in flow rates and strength, wastewater constituents, Characteristic of Municipal waste water, Quantity of storm water, Ground water infiltration.
Sewerage system, Layout, Types of sewers, Collection system, Appurtenances, Design of sanitary and storm water sewers, Maintenance of sewerage systems.
Sewage and Sludge pumping, Location, Capacity, Types of pumps, Pumping station design. (6)

Unit 2

Primary Treatment-Screening, comminuting, Grit removal, Oil and Grease trap
Chemical Precipitation,
Secondary Treatment-Activated sludge process, Process design and operating parameters, modification of ASP, Operational problems, trickling filter, classification, process design considerations, Secondary clarification. (8)

Unit 3

Fundamentals of Anaerobic treatment, Sludge characteristics, Treatment and disposal, Concept of different anaerobic reactors.
Low cost wastewater treatment methods-Principles of waste stabilization pond.
Design and operation of oxidation pond, aerobic & anaerobic Lagoons, Aerated Lagoon, Oxidation ditch, Septic tank.
Selection of alternative Treatment process flow sheets. Concept of recycling of sewage. (6)

Section II

Unit 4

Disposal of waste water-stream pollution, Self Purification, DO sag curve, Streeter Phelp's Equation, Stream classification, disposal on land, effluents standards for stream and land disposals. (5)

Unit 5

Solid waste management-Solid wastes Definition, Types, Sources, Characteristics, Functional outlines-storage, Collection, Processing techniques, Methods of treatment of solid waste-Composting, Incineration, Pyrolysis and Sanitary land filling. Concept of Hazardous waste management. (5)

Unit 6

Air Pollution-Definition, Sources and classification of pollutants, Effect, Introduction to Meteorological aspects and control of industrial air pollution, Settling Chamber, Bag Filters, Cyclone separators, Scrubbers, Electrostatic precipitators. Control of vehicular pollution. Air quality standards. (6)

Unit 7

Noise Pollution-Decibel scales, Noise characteristics and measurements, Levels of noise and standards, control measures of community and industrial noise. Introduction to Environmental Impact Assessment and Environmental Legislation.(4)

Term work

Term work shall consist of the following:

- A) Characterization of Municipal Waste water.
- B) Demonstration of HVS and Auto exhaust analyzer.
- C) Design of sewerage system and treatment system for a small urban area.
- D) Visit to sewage treatment plant.

Term work submission shall consist of the following:

- 1)Journal containing experiments carried out in part A & B of the term work & Visit report.
- 2)Detail designs and appropriate drawings required part C of the term work.

REFERENCES:

1. Peavey, H.S.Rowe, D.R., and Tchobanoglous, Environmental Engineering, McGraw-Hill Book Company.
2. Viessman W. and Hammer M.J. Water supply and pollution Control, Harper Collins College publishers.
3. Hammer M.J. Water and Waste water Technology, Prentice-Hall of India Private Limited.
4. Manual on sewerage and sewage Treatment-Government of India Publication.
5. Masters.G.M. Introduction to Environmental Engineering and Science.
6. Rao.M.N. and Rao H.V.N. Air pollution, Tata McGraw Hill ,1990.

7. Bhide A.D. and Sundrasen B.B., Solid Waste Management in Developing Countries, Indian National Scientific Documentation Centre New Delhi.
8. Metcalf & Eddy, Waste Water Engg. Treatment & Disposal, Tata McGraw Hill , 1982.
9. Garg S.K., Sewage Disposal and Air Pollution Engineering, Khanna Publishers.
10. Canter, Environmental Impact Assessment, TMH Publication.
11. Manual on Municipal Solid Waste Management, Ministry of Urban Development Govt. of India.

★★★★★ B+

T.E. (Civil/Environmental) Part-I

6. ENGINEERING MANAGEMENT - I

Teaching Scheme:

Lectures: 3 Hours /Week

Examination Scheme:

Theory Paper : 100 Marks

SECTION – I

Unit 1

(06)

Evolution of Management thought

1. Scientific
2. Human behaviour
3. System approach (Introduction to elements of systems – input, output, process restriction, feedback)
4. Contingency Approach

Contributions by Taylor, Frank and Lillion, Gilbreth, Henry Fayol, Elton Mayo, McGregor (Theory X and Theory Y), H.L.Gantt, Maslow.

Unit 2

(06)

Functions of Management

1. Planning – Nature and purpose of planning, strategies and policies, Management by objectives.
2. Formal and informal organization, Centralization, Decentralization, Line, Line and Staff, Functional organization, Principles of site layout.
3. Leading and directing, controlling and coordination (Brief introduction only)
4. Communication process, motivation

Unit 3

(06)

Importance of Decision Making, steps in decision making, analysis of decision, decision under certainty, uncertainty and decision under risk, criterion of optimism and regret, sensitivity of criteria and decision under conflict, expected monetary value, decision tree, Theory of games (dominance pure and mixed strategy).

SECTION – II

Unit 4 (06)

1. Linear Programming, simple L-P model, simplex method – Duality, sensitivity analysis.
2. Application of Linear Programming in Transportation and Assignment models (Civil Engineering examples)

Unit 5 (06)

1. Monte-Carlo simulation, queuing or waiting line theory (simple problems)
2. Dynamic programming (simple problems to be covered), introduction to emerging optimization technique – Artificial Neural Network, Zenithic Algorithm.

Unit 6 (06)

Material Management – Purchasing principles, stores, coding system function, responsibilities, record and accounting.
Inventory control – An introduction, inventory cost, EOQ analysis, ABC analysis, safety stocks.

Recommended Books :

1. Engineering Management – Stoner
2. Principles of Management – Davar
3. A Text book of Management – A.S.Deshpande
4. Essentials of Management – Koontz, Dounell and Weigrick
5. Management and Organization by Kast and Rosinweig – Tata McGraw Hill publication.
6. Operation Research – S.H.Deshpande
7. Operation Research – Wagner Wikey Easter Ltd., new Delhi
8. Quantitative Techniques in Management – Vol. I, L.C.Zhamb
9. Material Management – Gopal Krishnan, Sdueshan
10. Executive Decisions & Operation Research by Miller and Stars, Prentice Hall of India, Publisher.

Note :

1. More emphasis should be given to the case studies related to topics in Section I.
2. Problems related to Civil Engineering are to be set up in question paper.

★★★★★ **B+**

Shivaji University, Kolhapur
T.E. (Civil/Environmental) Part-II

1. STRUCTURAL MECHANICS-III

Teaching Scheme:

Lectures: 3 Hours /Week

Tutorials: 1 Hour /Week

Examination Scheme:

Paper Duration: 3 Hours

Theory paper: 100 Marks

SECTION I

- Unit 1** (3)
Concept of Indeterminate structures, Degree of freedom, Degree of kinematic and static Indeterminacy, Methods of analysis and comparison of force and displacement methods.
- Unit 2** (5)
Force Method- Consistent deformation method, Fixed Beams, Propped cantilevers, Yielding of Supports.
- Unit 3** (3)
Force Method- Clapeyron's theorem of three moments, Continuous beams, Sinking of supports.
- Unit 4** (8)
Force Method- Energy Theorems, Betti's Law, Maxwell's reciprocal theorem, Castigliano's theorem and Unit Load method. Statically indeterminate beams, trusses, portal frames, two hinged arches. (Degree of S.I. < 2)

SECTION II

- Unit 5** (6)
Displacement method- Slope deflection equation method, Modified slope deflection equation, Sinking of supports, Application to beams, Portal frames without and with sway.
- Unit 6** (6)
Displacement method- Moment distribution method, Sinking of supports, Application to beams, portal frames without and with sway. Symmetry and antisymmetry.
- Unit 7** (4)
flexibility method- flexibility coefficients, Development of flexibility matrix, Analysis of beams and portals (Degree of S.I. < 2)
- Unit 8** (4)
Stiffness method- stiffness coefficients. Development of stiffness matrix, Analysis of beams and portals (Degree of S.I. < 2)

RECOMMENDED BOOKS

1. Analysis of Structures- Vol.II by Vazirani & Ratwani
2. Basic Structural Analysis by C.S.Reddy. Tata McGraw-Hill pub.
3. Theory of Structures by S.P. by Timoshenko & Young.
4. Structural Analysis by G.S.Pandit.
5. Structural Analysis- Matrix approach by Pandit & Gupta.
6. Mechanics of Structures- Vol.II by S.B.Junnarkar
7. Matrix analysis of structures by Gere & Weaver.
8. Indeterminate structural analysis by C.K. Wang.

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T.E. (Civil/ Environmental Engineering) Part-II 2. Geo-technical Engineering –II

Teaching scheme:

Lectures : 3 Hrs/week
Practicals : 2 Hrs/week
Tutorials : 1 Hr/ week

Examination scheme:

Theory paper : 100marks
Term work : 50 marks

Section –I

Unit 1:

- a) Introduction, General requirements to be satisfied for satisfactory performance of foundations. (1)
- b) **Soil exploration:** Necessity, Planning, exploration Methods, auger boring (hand and continuous flight augers), wash boring, rotary drilling. Soil sampling- disturbed and undisturbed, Rock drilling and sampling, Core barrels, Core boxes, core recovery, RQD. (3)
- © **Field tests for Bearing Capacity evaluation.:** Plate load test, standard penetration test, pressuremeter tests, test procedure & limitations. (3)

Unit 2:

- a) **Theoretical Bearing Capacity Analysis- Modes of failure,** Terzaghi's bearing capacity equation with derivation, I.S. Code method of bearing capacity **evaluation**,. Effect of water table, eccentricity of load. Safe Bearing capacity and allowable bearing pressure, Bearing capacity computations as per I.S. 6403-1981 approach. bearing capacity **evaluation** from Plate load test, S.P.T. and pressuremeter tests. (6)
- b) **Foundation Settlement:** Immediate settlement- computations from I.S. 8009- 1976 (Part I) approach and from Plate load test observations, consolidation settlement computations, total , differential settlement, Tolerable settlement, Angular distortion. (3)

Unit 3:

a) Foundation construction in difficult soils- Guidelines and care to be exercised in weak and compressible soils, expansive soil, collapsible soils and corrosive soils. (2)

b) Ground improvements: Brief introduction to pre compression, sand drains, grouting, vibrofloatation, soil reinforcement. (2)

Section –II

Unit 1:

shallow foundation: Assumptions & limitations of rigid design analysis. design of Isolated, combined, strap footing(Rigid analysis), Raft foundation(elastic analysis), floating foundations (R.C.C. Design are not expected) (4)

Unit2:

Deep foundation: (6 Lectures)

a) Pile foundation: Classification, single pile capacity, evaluation for R.C.C. cast insitu pile in cohesive, cohesionless and mixed soils (static method), Negative skin friction, Under reamed piles – equipment, construction and precautions. Group action piles, spacing of piles in a group, Group efficiency. (6)

b) Caissons Foundations - Box, Pneumatic, open (well) caissons, Shapes of wells, components, Forces, Grip length, well sinking, practical difficulties and remedial measures. (3)

Unit 3:

Sheet Piles: Classification, Design of cantilever sheet pile in cohesionless and cohesive soils. Design of anchored sheet pile by free earth support method.

Cellular Cofferdams: Types, cell fill stability considerations.. (6)

Unit 4

Slope Stability: Stability of finite slopes- slip circle method, Semi graphical and graphical methods, location of critical slip circle center, Friction circle method, , Stability number concept and its use. (4)

Term work: (25 marks)

a) Visit to foundation construction sites and preparation of the report.

b) Design Problem-

1) Bearing capacity calculation by various method and settlement calculations

2) Design of shallow foundation

3) Pile and Pile group

4) Cantilever sheet pile

5) Stability analysis

Recommended Books:

1. Foundation Engineering by B.J. Kasamalkar
2. Soil Mechanics and Foundation Engg. by V.N.S.Murthy
3. Soil Mechanics and Foundation Engg. By K.R.Arora
4. Soil Mechanics and Foundation Engg. by B.C. Punmia
5. Foundation design manual-Dr. N.V. Nayak. Dhanpat Rai and Sons
6. Foundation Engineering by S.P.Brahma
7. Principles of Geotechnical Engg. By Braja Das
8. Geotechnical Engg. By Coduto
9. Foundation analysis & design by J.E.Bowles
10. Foundation design by W.C.Teng
11. Foundation design & construction by M.J.Tomilson
12. Sheet Pile by Lee
13. Relevant Indian standard code on field tests and other topics.

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T.E. (Civil/Environmental) Part-II
3 TRANSPORTATION ENGINEERING - I

Teaching Scheme:

Lectures: 3 Hours /Week

Practical: 2 Hours/Week

Examination Scheme:

Theory Paper : 100 Marks

Term Work : 25 Marks

Oral : 25 Marks

SECTION – I

HIGHWAY ENGINEERING (Marks 50)

Unit 1

(4)

1. Introduction

Importance of Infrastructure development – Economic, Social, Political role, modes of transportation, Scope of Highway Engineering, I.R.C., Central Road Fund, M.V.Act, N.H.Act, C.R.R.I. – Central Road Research Institute, Road development plans, Road classification according to 3rd road development plan, organization and administration set up for transport sector, Finance options.

2. Highway Alignment

Definition, requirements, factors controlling alignment, alignment of hill roads, surveys for highway location.

Unit 2 (6)

1. Introduction

Terrain classification, Vehicle characteristics, cross-sectional elements, sight distances, horizontal alignment – effect of centrifugal force, super-elevation, widening of pavement on horizontal curve, Vertical alignment – gradient, vertical curves, design problems.

2. Highway Materials

Soil – relevant properties.

Aggregates – strength, hardness, toughness, soundness, durability, shape, specific gravity, water absorption.

Bituminous materials – Bitumen, Tar, Asphalt – various properties, Marshall stability test.

Unit 3 (6)

1. Pavement Design

Pavement types, components, functions, design factors, Design of flexible pavements, CBR Method, IRC recommendation, Design of rigid pavement – Westergaard's analysis of wheel load stress, temperature stresses.

2. Highway Construction

Earth roads, WBM roads, bituminous roads, concrete roads, stabilized soil road,
MOST specifications.

Unit 4 (4)

1. Highway Drainage

Necessity, surface and subsurface drainage, maintenance and repairs.

2. Traffic Engineering

Objectives, traffic surveys, intersections, grade separation, traffic signs and signals, parking, Traffic Management.

SECTION II (Marks 50)
AIRPORT ENGINEERING

Unit 5 (3)

1. Introduction

Terminology, components of an aircraft, aircraft characteristics, ICAO Airport
Classification.

2. Airport Planning

Airport surveys, Site selection, Airport Obstructions, layouts, zoning laws, Environmental considerations.

Unit 6 (4)

1. Runways

Orientation, wind rose, Basic runway length, Geometric design, Airport capacity,

Runway patterns, design problems.

2. Terminal Buildings

Site selection, facilities, aprons parking systems, No. of gates.

Unit 7 (7)

1. Taxiways

Layout, geometrical standards, exit taxiways, design problems.

2. Hangers

Function, types, requirement, blast fences/

3. Airport Drainage

Necessity, types

4. Air Traffic Control

VFR, IFR, Visual aids, airport lighting

5. Heliports

Characteristics of helicopters, planning of heliports, site selection, size orientation, terminal area, obstruction, heliport markings and lighting.

Unit 8 (6)

1. **Pipeline Transport:** basic data, materials and standards, Engineering Design Considerations for pumping of hydrocarbons (gas/oil).
2. Soil investigations, construction techniques, maintenance and safety
3. Corrosion and its prevention

Term Work: (At least 10 experiments from following)

1. Tests on Aggregates

- i. Shape test
- ii. Specific Gravity and Water absorption test
- iii. Stripping value Test
- iv. Soundness Test
- v. CBR test on soil and aggregates

2. Test on Bituminous Materials

- i. Penetration Test
- ii. Softening point test
- iii. Flash and fire point test
- iv. Ductility test
- v. Viscosity Test
- vi. Specific Gravity Test
- vii. Demonstration of Marshall Test.

3. Tutorial on Design Problems

4. Recent developments in the planning, designing of Highway/airways systems, major projects, software – A report is expected.

List of Books

Text Books

1. Highway Engineering by Justo and Khanna, New Chand & Bros., Roorkee.
2. Transportation Engineering by G.K.Rao, Tata McGraw Hill Company
3. Principles and Practice of Highway Engineering by Dr.L.R.Kadiyali
4. A Course in Highway Engineering by S.P.Bindra
5. A Course in Highway Engineering by S.C.Saxena
6. Principles and Practice of Highway Engineering by R.C.Sharma and S.K.Sharma
7. Airport Engineering by Kanna and Arora / Rangwala
8. Planning and design of Airports by Horonjeff.
9. Piping and pipe support system Design and Engineering by Paul R Smith and Tvann Lann Tata McGraw Hill.

Reference Books

1. Principles of Highway Engineering and Traffic Analysis, 2nd Edition, Fred Mannering and Walter Kilaveski, John Willey & Sons, 1998.
2. Piping Design Hand book by John J Mc Ketta, Marcel Dekker Publication.
3. Piping hand book 7th Edition by Mohindar Nayyer.
4. ASME B31.3 Process Piping by Glann E Woods.

★★★★★ **B+**

T.E. (Civil/Environmental) Part-II

4. ENGINEERING MANAGEMENT - II

Teaching Scheme:

Lectures: 4 Hours /Week

Practical: 2 Hours/Week

Examination Scheme:

Theory Paper : 100 Marks

Term Work : 25 Marks

Oral Exam. : 25 Marks

SECTION – I

Unit 1 (10)

Project Management

1. Introduction, steps in Project Management – work break down structure
2. Bar Chart, Mile stone chart
3. Development of network – Representation by AOA and AON – Fulkerson's Rule
4. CPM : Introduction, Time estimates, floats, critical path.

Unit II (08)

1. Network compression – Least Cost and optimum duration.
2. Resource allocation – smoothening and levelling.
3. Updating – needs, steps, project duration, calculation for updated network.

Unit III (04)

Introduction to PERT

Concept of probability, normal and Beta Distribution, Central limit theorem. Time estimates and calculations of project duration, critical path, slack, probability of project completion.

Unit IV (04)

Precedence Network – simple problems

Introduction to Work Study – Methods study and time measurement, definition, steps and introduction to recording techniques.

SECTION – II

Unit V (06)

1. Introduction to Engineering economics, importance, demand and supply, types of costs, interest – simple, compound, continuous, effective.
2. Value of Money – time and equivalence, tangible and intangible factors, introduction to inflation.
3. Cash – flow diagram.
4. Interest factors – Uniform series factors – derivations.

Unit VI (10)

Economic comparisons –

- a. Discontinuing methods : Present worth method, equivalent annual cost method, capitalized cost method, net present value, internal rate of return, Benefit cost ratio.
- b. Non discontinuing criteria : Payback and urgency criteria.

Unit VII (04)

1. Linear Break even analysis – Problems – –
2. Quality Control – Concept, Statistical Methods – control charts (X, R, p, c charts)

Unit VIII (06)

1. Total quality Management – Philosophy of Juran, Deming, importance
2. Quality Circle – Implementation step
3. ISO 9000 series and 14000 series – only introduction and concept

Term Work :

1. At least two exercises on each unit.
2. Problems on Bar chart, CPM, PERT, Precedence, engineering economics to be solved preferably using available relevant softwares.
3. Visit report covering project management and quality control technique.

Recommended Books :

1. Principles of Construction Management by Roy Pilcher.
2. Project Cost Control in Construction by Roy Pilcher.
3. C.P.M. in Construction Practice by Antill and Woodhead.
4. Management and Engineering Economics by G.A.Taylor.
5. Statistical Quality Control by R.C.Gupta.
6. Engineering Economics – Layland Blank and Torquin.
7. Project Management by Naik
8. Work Study by O.P.Khanna
9. Handbook of Quality Control – Juran
10. Primer on TQM – Sunder Raju
11. CPM PERT – Srinath
12. CPM PERT – B.C.Punmia

★★★★★ B+

T. E. (CIVIL/ENVIRONMENTAL ENGINEERING) PART-II

5. Environmental Engineering-II

Teaching Scheme:
Lectures:3Hrs/Week
Practical:2Hrs/Week

Examination Scheme:
Theory paper : 100 Marks
Term Work : 50 Marks

Section-I

Unit 1

Components of wastewater flows, wastewater sources and flow rate, Variations in flow rates and strength, wastewater constituents, Characteristic of Municipal waste water, Quantity of storm water, Ground water infiltration.
Sewerage system, Layout, Types of sewers, Collection system, Appurtenances, Design of sanitary and storm water sewers, Maintenance of sewerage systems.
Sewage and Sludge pumping, Location, Capacity, Types of pumps, Pumping station design. (6)

Unit 2

Primary Treatment-Screening, comminuting, Grit removal, Oil and Grease trap
Chemical Precipitation,
Secondary Treatment-Activated sludge process, Process design and operating parameters, modification of ASP, Operational problems, trickling filter, classification, process design considerations, Secondary clarification. (8)

Unit 3

Fundamentals of Anaerobic treatment, Sludge characteristics, Treatment and disposal, Concept of different anaerobic reactors.
Low cost wastewater treatment methods-Principles of waste stabilization pond.
Design and operation of oxidation pond, aerobic & anaerobic Lagoons, Aerated Lagoon, Oxidation ditch, Septic tank.
Selection of alternative Treatment process flow sheets. Concept of recycling of sewage. (6)

Section II

Unit 4

Disposal of waste water-stream pollution, Self Purification, DO sag curve, Streeter Phelp's Equation, Stream classification, disposal on land, effluents standards for stream and land disposals. (5)

Unit 5

Solid waste management-Solid wastes Definition, Types, Sources, Characteristics, Functional outlines-storage, Collection, Processing techniques, Methods of treatment of solid waste-Composting, Incineration, Pyrolysis and Sanitary land filling. Concept of Hazardous waste management. (5)

Unit 6

Air Pollution-Definition, Sources and classification of pollutants, Effect, Introduction to Meteorological aspects and control of industrial air pollution, Settling Chamber, Bag Filters, Cyclone separators, Scrubbers, Electrostatic precipitators. Control of vehicular

pollution. Air quality standards. (6)

Unit 7

Noise Pollution-Decibel scales, Noise characteristics and measurements, Levels of noise and standards, control measures of community and industrial noise.

Introduction to Environmental Impact Assessment and Environmental Legislation.(4)

Term work

Term work shall consist of the following:

- E) Characterization of Municipal Waste water.
- F) Demonstration of HVS and Auto exhaust analyzer.
- G) Design of sewerage system and treatment system for a small urban area.
- H) Visit to sewage treatment plant.

Term work submission shall consist of the following:

- 1)Journal containing experiments carried out in part A & B of the term work & Visit report.
- 2)Detail designs and appropriate drawings required part C of the term work.

REFERENCES:

1. Peavey, H.S.Rowe, D.R., and Tchobanoglous, Environmental Engineering,
2. McGraw-Hill Book Company.
3. Viessman W. and Hammer M.J. Water supply and pollution Control, Harper
4. Collins College publishers.
5. Hammer M.J. Water and Waste water Technology, Prentice-Hall of India
6. Private Limited.
7. Manual on sewerage and sewage Treatment-Government of India Publication.
8. Masters.G.M. Introduction to Environmental Engineering and Science.
9. Rao.M.N. and Rao H.V.N. Air pollution, Tata McGraw Hill ,1990.
10. Bhide A.D. and Sundrasen B.B., Solid Waste Management in Developing Countries, Indian National Scientific Documentation Centre New Delhi.
11. Metcalf & Eddy, Waste Water Engg. Treatment & Disposal, Tata McGraw Hill , 1982.
12. Garg S.K., Sewage Disposal and Air Pollution Engineering, Khanna Publishers.
13. Canter, Environmental Impact Assessment, TMH Publication.
14. Manual on Municipal Solid Waste Management, Ministry of Urban Development Govt. of India.

★★★★★ B+

T.E. (CIVIL/ENVIRONMENTAL ENGINEERING) - PART II

6. STRUCTURAL DESIGN AND DRAWING- I

Teaching Scheme:

Drawing: 4 hours per week

Examination scheme:

Term Work: 50 marks

Oral Exam. 50 Marks

The term work shall consist of detailed structural design and drawing of the following steel structure along with necessary drawings.

1. INDUSTRIAL SHED: Roof truss, Gantry girder, Roof and gantry columns, bracing system, column bases.

OR

1. INDUSTRIAL SHED: With portal or gable frames of solid or open web sections, Gantry girder, bracing system, column bases.

2. ANY ONE of the following:

a) **BUILDING FRAMES:** Secondary and main beams, column and column bases, beam- to- beam connection, column- beam connection, design of typical members.

b) **FOOT BRIDGE:** Influence lines, cross beam, main Truss, Raker, joint details, support details.

c) **PLATE GIRDER:** Design of welded plate girder.

Note: -- Analysis results of the first problem shall be compared with the results by any standard software package.

★★★★★ B+

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