**CONCRETE STRUCTURES II**

1. **Elements of Prestressed Concrete**

Principles and systems, material properties, losses of prestress, I.S. specification, analysis and design of sections for flexure and shear. Introduction to continuous beams.

1. **Continuous and Curved Beams**

Design of continuous R.C. beams, moment redistribution, beams curved in plan.

1. **Shrinkage and Creep**

Effect of shrinkage and creep on stresses in R.C. columns and beams.

1. **Multistoreyed Building Frames**

Analysis by approximate methods, design and detailing, I.S. specification and loading standards.

1. **Water Tanks and Towers**

Water Tanks and Water Towers-design of rectangular, circular and Intzetype tanks, column brace type staging and circular raft foundations.

1. **Culverts and Bridges**

Design of slab culverts, bridge decks, cross and main beams for bridges, T-beam bridge design for I.R.C. loadings.

**List of Experiments**

1. Initial drying shrinkage, moisture movement, and coefficient of expansion of concrete.
2. Stress strain curve of concrete.
3. Behaviour of under reinforced and over reinforced R.C. beams in flexure.
4. Behaviour of R.C. beams, with and without shear reinforcement in shear.
5. Bond strength between steel bar and concrete (a) in a beam specimen and (b) by pull-out test.
6. (a) Fineness of cement by Air Permeability method.

(b) Soundness of cement by Le-Chatalier’s Apparatus.

(c) Compressive strength of cement.

1. (a) Water content for standard consistency of cement.

(b) Initial and final setting times of cement.

1. Moisture content and bulking of fine aggregate.
2. Fineness modulus of coarse and fine aggregates.
3. Workability of cement concrete by (a) Slump test, and (b) compaction factor test.
4. Concrete mix design for a given concrete strength and slump by I.S. Code method.

**References**

* 1. Krishna, jai and Jain, O.P., “Plain and Reinforced Concrete”. Vol. II, Nem Chand and Bros., Roorkee, 1998.
	2. Chandra Ram, “Design of Concrete Structure”, Vol. II, Standard Book House, New Delhi, 1986.
	3. Gray, W.S. and Mannings, G.I., “Reinforced Concrete Water Towers”, Bunkers, Silos & Gantries, Concrete Publication Limited, 1973.
	4. Reynolds, C.E. and Steadman, J.C., “Reinforced Concrete Design Hand Book”, Cement and Concrete Association, London, 1976.

 **CONSTRUCTION MANAGEMENT**

1. **Introduction**

Objectives and functions of project management, Finance and cost accounting, Quality control, Methods of motivation and incentives, Importance of safety and safety measures.

1. **Network Techniques**

Introduction to CPM/PERT methods and their use in construction planning, preparation of construction schedule for jobs materials, equipments, labour and funds, and project monitoring.

1. **Construction Equipments**

Different type of construction equipments viz., earth moving equipments, dewatering and pumping equipments, grouting equipments pile driving equipments and other construction equipments such as conveyors, cranes, concrete mixers, vibrators, road construction machinery, rollers, compactors etc. factors affecting the selection of construction equipments

1. **Equipment Management**

Productivity, operational cost, owning and hiring cost and the work motion study.

1. **Contract management**

Legal aspects of contraction, laws related to contracts, land acquisition, labour safety and welfare. Different type of contracts, their relative advantages and disadvantages. Elements of tender operation, prequalification of contracts, Evaluation of tenders, Contract negotiation and award of works, settlement of disputes, arbitration and commissioning of the project.

**Reference**

1. Sreenath L.S., “PERT and CPM”, Affiliated East West Press, Now Delhi, 1975.
2. Punmia B.C., and Khandelwal K.K., “PERT and CPM”, Laxmi Pub., New Delhi, 1997.
3. Peurifoy R.L., “Construction Planning and Management”, McGraw Hill Book co., Inc., New York, 1979.
4. Verma Mahesh, “Construction Planning and Management”, Delhi Metropolition, 1996.
5. R.L.Peurify, “Construction Planning : Equipments and Methods”, Tata McGraw Hill, Inc. Distributors, New Delhi, 1994.
6. Satyanarayanan & Saxena, “Construction Planning and Equipment”, Standard Publishers Distributors, New Delhi, 1994.

 **ENVIRONMENTAL ENGNERING II**

1. **General**

**Terms:** Sewerage, domestic sewage, sewage treatment, disposal, scope, role of an environmental engineer, historical overview.

1. **Sewage Characteristics**

**Quality parameters:**  BOD, COD, TOC, Solids, DO, Nitrogen, Phosphorus, Standards of disposal into natural water courses and on land, Indian standards.

1. **Collection of Sewage**

**Systems of sewerage:** separate, combined, and partially separate, components of sewerage system, systems of layout, quantity of sanitary sewage and variations, quantity of storm water, Rational method, shapes of sewer, circular and egg shaped, Hydraulic design of sewers: diameter, self Rational cleansing velocity and slopes, Construction and testing of sewer lines, Sewer material, joints and appurtenances, Sewage pumping and pumping stations, Maintenance of sewerage system.

1. **Sewage Treatment**

**Various units :** their purposes sequence and efficiencies, Preliminary treatment: screening and grit removal units, oil and grease removal, Primary treatment, Secondary treatment : activated sludge process, trickling filter, Sludge digestion and drying beds. Stabilization pond, Septic tank, Soakage systems, Imhoff tank**,** Recent trends in sewage treatment, advanced wastewater treatment: nutrient removal, solids removal.

1. **Wastewater Disposal and Reuse**

Disposal of sewage by dilution, self purification of streams, sewage disposal by irrigation & sewage farming, wastewater reuse.

1. **Plumbing for Drainage of Buildings**

Various systems of plumbing – one pipe, two pipe, single stack, traps, Layout of house drainage.]

**List of Experiments**

Determination of B.O.D. of sewage

Determination of C.O.D. of domestic and industrial sewage.

Determination of kjeldal nitrogen.

Determination of volatile, mixed, filtrable and dissolved solids.

Determination of optimum dose of coagulants.

Determination of iron and two heavy metal.

Measurement of SO2 in the ambient air.

Measurement of particulate matter in air.

**References**

1. Peavy, H.S., Rowe, D.R. and Tehobanoglous, G., “Environment Engineering”, McGraw Hill Book Company, 1985.
2. Fair, G.M., Geyer, J.C. and Okun, D.A. “Water and Wastewater Engineering”, John Wiley and Sons, Inc., 1996.
3. Viessman, Jr. and Hammer, M.J.,”Water Supply and Pollution Control”, Harper Collins College Publishers, 1985.
4. Standard Methods for the Examin

 **GEOTECHNICAL ENGINEERING II**

1. **Soil Exploration**

Purpose; Methods of soil exploration; Boring, sampling; Standard penetration test; Static and dynamic cone tests; Correlations between penetration resistance and strength parameters; Plate load test.

Planning of soil investigation; Number of bore holes and depth of exploration; Type of tests to suit soil conditions.

1. **Earth Pressure and Retaining Structures**

Earth pressure at rest; Active and passive earth pressure computation using Ranking’s and Coulomb’s

Earth pressure theories; Culmann’s graphical construction; Additional earth pressure due to surcharge and earthquake loading.

Stability analysis for retaining walls; Choice of backfill material and importance of drainage.

Bracings for open curs-Recommended design diagrams of earth pressure for typical soils.

Arching and its practical implications.

1. **Foundations**

Common type of foundations with examples; Brief illustration of situations where each one of them is adopted; Basic for design; Review of major soil parameters used in proportioning of foundations.

1. **Shallow Foundations**

Type and their selection; Terminology;

Bearing capacity-Terzaghi’s equation; Computation of bearing capacity in cohesion less and cohesive soils; Effect of various factors on bearing capacity; Use of field test data.

Settlement: Components of settlement; Limits of settlement; Stresses in soil below loaded areas ; Boussinesq equation for vertical stress; Concept of pressure bulb; New mark chat; Estimation of settlement of footing and rafts on sand using penetration and load test data; Estimation of settlement of footing / rafts on cohesive soils using consolidation test data; Corrections for rigidity and 3D consolidation effect; Proportioning of footings.

1. **Pile Foundations**

Situations where adopted; Type of piles; Outline of steps involved in proportioning; Bearing capacity and settlement of single and group of piles; Proportioning with field / lab data as input.

1. **Well Foundations**

Situations where adopted; Elements of wells; Type; Methods of construction; Tilt and shift; Remedial measure.

 **Proportioning –** Depth and size of wells on the basis of scour depth, bearing capacity and settlement; Terzaghi’s lateral stability analysis.

1. **Embankment Slopes**

Examples of embankments-Road and earth dam embankments: Modes of failure and the usual protective measure; Slope inclinations usually adopted; Stability Analysis: Infinite slopes and the concept of factor of safety; Friction circle method; Metl of slices; Bishop’s simplified method; Acceptable values of factor of safety; Critical conditions the stability of earth dams, and approximate analyses.

1. **Introduction to Machine Foundations**

Type of machines and their foundations; Terminology; Design criteria; Field methods of deter minis design parameters-Cyclic plate load test; Block vibration test; Response of block foundation under vertical vibrations.

1. **Foundation on Expansive Soil**

Identification of expansive soil, Problem associated with expansive soil, Design consideration of foundation on expansive soil, Under reamed piles.

**Laboratory Experiments**

1. Direct shear test.
2. Triaxial test.
3. CBR test.
4. Consolidation test.
5. Plate load test.
6. Boring, Sampling and SPT.
7. Vane shear test.
8. Block vibration test.
9. Static and dynamic cone tests.

**References**

1. Gopal Ranjan and Rao A.S.R., “Basic and Applied Soil Mechanics”, (Revised Edition) New Age, New Delhi. 1998.
2. Peck, R.B. , Hanson, W.E. and Thornburn, W.H. “Foundation Engineering”, 2nd Edition, John Wiley, New York. 1976
3. Tomlinson, M.J. “Foundation Design and Construction”, 5th Edition, ELBS, Singapore. 1988.
4. Alam Singh, “Soil Engineering in Theory and Practice”, Vol. II, Asia Publishing House, New Delhi, 1981.

 **OPEN CHANNEL FLOW** (CE1601)

1. **Introduction**

Defference between open channel flow and pipe flow, geometrical parameters of a channel, continuity equation.

1. **Uniform Flow**

Chezy’s and Manning’s equations for uniform flow in open channel, velocity distribution, most efficient channel section.

1. **Energy and Momentum Principles**

Critical depth, concepts of specific energy and specific force, application of specific energy principle for interpretation of open channel phenomena, flow through vertical and horizontal contractions.

1. **Non-Uniform Flow in Open Channel**

Equation of gradually varied flow and its limitations, flow classification and surface profiles, integration of varied flow equation by analytical, graphical and numerical methods, flow in curved channels.

1. **Hydraulic Jump, Surges, Water Waves**

Classical hydraulic jump, evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds, equation of motion for unsteady flow, open channel surge, celerity of the gravity wave, deep and shallow water waves.

 **List of Experiments**

1. To determine the Manning’s coefficient of roughness ‘n’ for the bed of a given flume.
2. To study the velocity distribution in an open channel and to determine the energy and momentum correction factors.
3. To study the flow characteristics over a hump placed in an open channel.
4. To study the flow through a horizontal contraction in a rectangular channel.
5. To calibrate a broad-crested weir and study the pressure distribution on the upstream face of weir.
6. To study the characteristics of free hydraulic jump.
7. To study the flow over a free overfall in an open channel and to determine the end depth.

**References**

1. Garde, R.J., and A.G. Mirajgaoker, “Engineering Fluid Mechanics (including Hydraulic Mechanics)”, IInd ed., Nem Chand & Bros., Roorkee, 1983.
2. Ranga Raju, K.G., “Flow Through Open Channel,” Tata McGraw Hill, New Delhi, 1993.
3. Asawa, G.L., “Experimental Fluid Mechanics”, Vol. 2, Nem Chand and Bros., 1992.

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