VI SEMESTER

CE 1601 OPEN CHANNEL FLOW (2-1-0)

I. Introduction

Difference between open channel flow and Pipe Flow', geometrical Parameters of a channel continuity equation.

II. Uniform Flow

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

III. 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.

IV. Non-Uniform Flow in Open Channel

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

V.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.

CE 1608 OPEN CHANNEL FLOW LAB. (0-0-3)

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 dctcrminc thc 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.
3. 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 Channels", Tata McGraw Hill, New Delhi. 1993.
3. Asawa, G.L. ". "Experimental Fluid Mechanics", Vol. 2, Nem Chand and Bros., 1992.

CE 1602 CONSTRUCTION MANAGEMENT (2-1-0)

I. Introduction

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

II. Network Techniques

Introduction to CPM/PERT methods and their use in construction planning, preparation construction Schedules for jobs, materials, equipments, Labour and funds, and project monitoring

III. Construction Equipments

Different types of construction equipments viz., earth moving equipments, dewatering and pumping equipments, grouting equipments, pile driving equipments and other construction equipment such as conveyors, cranes, concrete mixers, vibrators, road construction machine compactors etc. Factors affecting the selection of construction equipments.

IV. Equipment Management

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

V. Contract management

Legal aspects of contraction, laws related to contracts, land acquisition, Labour safety and welfare Different types 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.

References

1. Sreenath L.S., "PERI and CPM", Affiliated East West Press, New Delhi, 1975.
2. Punmia B.C., and Khandelwal K.K., "PERT and CPM", Laxmi Pub., New Delhi, 19'
3. Peurifoy R.L., "Construction Planning, Equipments and Methods", McGraw Hill Book Co., Inc., New York, 1979.
5. Verma Mahes!}, "Construction Planning and Management"~ Delhi Metropolitan, 1996.
6. R.L.Peurify ,"Construction Planning: Equipments and Methods", Tata McGraw Hill. Inc.
8. Satyanarayanan & Saxena, "Construction Planning and Equipment", Standard Publishers Distributors, New Delhi, 1994.

CE 1603 TRANSPORTATION ENGINEERING II(3-1-0)

I. **History of Indian Railways,** Component parts of railway track, Problems of multigauge system wheel and axle arrangements, Coning of wheels, various resistances and their evaluation, hauling capacity and tractive effort, stresses in rail, sleepers, ballast and formation.

II. Permanent Way Component Parts

Types of rail sections creep, Wear and failure in rails, Rail joints, Welding of rails, SWR and LWR sleepers requirements and types. Rail fittings, bearing plates, anti-creep devices, check and r rails. Ballast requirements, Specifications, Foml ation, cross section, drainage.

III. GeometricoDesign

Alignment, horizontal curves, super elevation, equilibrium cant and cant deficiency, Length oftr curves, Gradients and grade compensation, vertical curves.

IV. Points and Crossing

Design of simple tum out, various tYPl:S of track jW1ction and their configurations.

V.**Signalling and Interlocking** Control of train movements and monitoring. types of signals. principle of interlocking, Modernisa of railways and railway tracks. High speed tracks

VI. Air Transport Development Airport scenario in India-Stagl:s ofdcvdopmcnt, Aircmft characteristics. airport planning, site sclccti Obstruction and Zoning Laws, Imaginary surfaces, Approach zones and turning zones.

VII. Runway and Taxiway Design

Elements of runway, orientation and configuration, Basic runway length and corrections, Gcome design elements. Taxiway. design. ivl ain and exit Taxiways. Separation clearance, Holding apro Typical airport layouts. Terminal building. gate position ..

VIII. Visual Aids and Air Traffic Control Airport marking and lighting, Airway and airport traffic control, Instrumental landing systems and other air navigation aids.

IX. Harbours

Types of harbors, Size and accessibility, Tides, wind and wave. Dynamic effect of wave action Breakwaters and their classification, mound construction.

X.Docks

Types of Docks, Shape and size. Caissons for dock entrances, Floating docks and their design considerations.

References

1.Aggarwal, M.M., "Raihvay Engineering", Student Edition: Prabha & Co., New Delhi. 1997.

2.Saxena, S.C. and Arora, S.P., "A Text Book of Railway Engineering'.' Dhanpat Rai & Sons, 199?

3. Mundrey, *I.S.*, "Railway hack Engineering", Tata McGraw-Hill Publishing Company Ltd., New Delhi 1994.

4. Track Manuals ofIndian Railways.

5. Indian Railways Permanent Way Manual, 1986.

CE 1604 CONCRETE STRUCTURES II (3-1-0)

I.Elements of Prestressed Concrete

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

II. Continuous and Curved Beams

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

III. Shrinkage and Creep

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

IV. Multistoreyed Building Frames

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

V. Water Tanks and Towers

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

VI. Culverts and Bridges

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

CE 1607-P CONCRETE LAB (0-0-3)

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) Soundncss of cement by Le-Chatalicr's Apparatus.
   (c) Compressive strength of cement.
7. (a) Water content for standard consistency of cement.
   (b) Initial and final setting times of cement.
8. Moisture content and bulking of fine aggregate
9. Fineness modulus of coarse and fine aggregates.
10. Workability of cement concrete by (a) Slump test, and (b) compaction factor test.
11. 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 Structures", Vol. II, Standard Book House, New Delhi, 1986.
3. Gray, W.S. and Mannings, *G.!.*, "Reinforced Concrete Water Towers", Bunkers, Silos & Gantries', Concrete Publication Limitcd. 1073.

4. Reynolds, C.E. and Steadman, *J.c.*, "Reinforced Concrete Design Hand Book", Cement and Concrete Association, London, 1976.

CE 1605 GEOTECHNICAL ENGINEERING II (3-1-0)

I. 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; Types of tests to suit soil conditions.

II. Earth Pressures and Retaining Structures

Earth pressure at rest; Active and passive earth pressure computations using Rankine'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 cuts-Recommended design diagrams of earth pressure for typical soils. Arching and its practical implications.

III. Foundations

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

IV. Shallow Foundations

Types and their selection; Terminology;
Bearing capacity- Terzaghi's equation; Computation o[bearing capacity in cohesionless 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; Newmark chart: Estimation of settlement of footings and rafts on sand using penetration and load test data; Estimation of settlement footings / rafts on cohesive soils using consolidation test data; Corrections for rigidity and 3D effect: Proportioning of footings.

V. Pile Foundations

Situations where adopted; Types 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.

VI. Well Foundations

Situations where adopted; Elements of wells; Types; Methods of construction; Tilt and shift: Remedial measures.

Proportioning - Depth and size of well I son the basis of scour depth. bearing capacity and settlement: Terzaghi's lateral stability analysis.

VII. Embankment Slopes

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

VIII. Introduction to Machine Foundations

Types of machine and their foundation Terminology; Design criteria; Field methods of determination design parameters-Cycle plate load test; Block vibration test; Response of block foundation under vertical vibrations.

IX. Foundation on Expansive Soil

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

CE1609-P GEOTECHNICAL ENGINEERING II LAB. (0-0-3)

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 Thom burn. W.H " Foundation Engineering", 2nd Edition, John Wiley, New York. 1976

3.Tomlinson, M.J., "Foundation Design and Construction", 5th Edition, ELBS, Singapore.]988.

4. Alam Singh "Soil Engineering in *Theory* and Practice", Vol. n, Asia Publishing House, New Delhi, 1981.

CE 1606 ENVIRONMENTAL ENGINEERING II (3-1-0)

I. General

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

II. Sewage Characteristics

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

III. Collection of Sewage

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

IV. 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, adv~nced wastewater treatment nutrient removal, solids removal.

V. Wastewater Disposal and Reuse

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

VI. Plumbing for Drainage of Buildings

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

CE 1610-P ENVIRONMENTAL ENGINEERING II LAB (0-0-3)

List of Experiment

1. Determination of B.0.D of sewage
2. Determination of C.O.D. of domestic and industrial sewage.
3. Determination of kjeldal nitrogen .
4. Determination of volatile, mixed, filterable and dissolved solids.
5. Determination of optimum dose of coagulants.
6. Determination of iron and two heavy metals.
7. Measurement oh SO2 in the ambient air
8. Measurement of particular matter in air.

References

1.Peavy, H.S., Rowe, D.R. and Tchobanoglous, G., "Environmental Engineering", McGraw Hill Company, 1985.

2.Fair, G.M., Geyer, J.e. and Okun, D.A., "Water and Wastewater Engineering", John and Sons, Inc., 1966.

3.Viessman, Jr. and Hammer, MJ., "Water Supply and Pollution Control", Harper Coil' College Publishers, 1985.

4.Standard Methods for the Examination of Water and Wastewater, 19th Edition, Prepared and published jointly by APHA, AWWA, WEF, 1985.