

CONCRETE TECHNOLOGY

Unit 1 Ingredients of Concrete:

Cement: Manufacturing process of cement, chemical composition, grades of cement, hydration, types of cement, Tests for cement: fineness, Standard consistency, setting time, soundness, and compressive strength. **Aggregates:** classification, requirements, Tests for coarse aggregates: specific gravity, grading of aggregate, Flakiness Index, Elongation Index, Impact value, abrasion value, crushing value. Tests for fine aggregates: specific gravity, sieve analysis, fineness modulus. Alkali aggregate reaction, bulking of sand, Artificial, and Recycled aggregate. **Water:** general requirements, quality of water.

Unit 2 Fresh Concrete:

Workability: factors affecting, different tests for measurement of workability. Segregation, bleeding. The manufacturing process of concrete: batching, mixing, transportation, compaction, curing of concrete, curing methods.

Unit 3 Hardened concrete:

Strength of concrete: w/c ratio, gel/space ratio, a gain of strength with age, maturity concept of concrete, the effect of the maximum size of aggregate on strength. Test on hardened concrete: compressive strength, comparison of compressive strength between cube test and cylinder test, flexural strength. The relation between compressive and tensile strength. Elastic constants, factors affecting modulus of elasticity, definition, and factors affecting creep and shrinkage. Nondestructive testing: Schmidt's rebound hammer, ultrasonic pulse velocity method.

Unit 4 Concrete Mix Design:

Objectives of mix design, different methods of mix design, factors affecting mix proportions, quality control of concrete, statistical

methods, acceptance criteria, Numerical on mix design by ACI 211.1-1991, IS 10262- 2009 and IS 456 -2000. Mix design of fly ash concrete by IS 10262 - 2009.

Unit 5 Admixtures in concrete:

- a) Chemical Admixtures: Plasticizers, Superplasticizers, Retarders, Air entraining agents, IS 9103 Specifications
- b) Mineral Admixtures: Fly ash, Silica Fume, GGBS, Rice husk ash, metakaolin

Unit 6 Special Concretes and Durability of concrete:

- a. Special Concretes: Lightweight concrete, Polymer modified concrete, the concept of fiber-reinforced concrete, High-performance concrete, Pumpable concrete, Roller compacted concrete, Self-compacting concrete.
- b. Durability of concrete: Significance, Permeability and Durability, Chemical Attack, Sulphate attack, Attack by Seawater, Acid attack, Chloride attack, Carbonation of concrete and its determination.

STRUCTURAL MECHANICS

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Unit 1: Principal planes & stresses: (6)

- 1.1 Normal and shear stresses on any oblique plane.
- 1.2 Concept of principal planes and stresses by analytical & graphical methods (Mohr's circle of stress 2-D).
- 1.3 Theories of failure: Maximum normal stress, maximum shear stress and maximum strain energy theory.

Unit 2: Combined direct and bending stresses: (6)

- 2.1 Combined direct and bending stresses, eccentric load, core /kernel of section.
- 2.2 Stability analysis of gravity dam, retaining wall & chimney.

Unit 3: Influence line diagrams: (6)

- 3.1 Muller's Breslau's principle & its applications to statically determinate simple and compound beam.
- 3.2 ILD for member forces in statically determinate truss.

Unit 4: Buckling of long columns: (6)

4.1 Effective length for various end conditions.

4.2 Slenderness ratio.

4.3 Euler's theory & Rankine's theory.

Unit 5: Slope and deflection of determinate beams: (6)

5.1 Double integration method.

5.2 Macaulay's method.

5.3 Moment-Area method & Conjugate beam method.

Unit 6: Torsion of circular shaft: (6)

6.1. Analysis of circular shaft subjected to torsion.

6.2 Power transmitted to circular shaft.

6.3 Shafts subjected to combined bending, torsion & axial thrust.

Surveying-II

Unit 1-Measurement of distances and elevations

a) Tachometry – Principles, Suitability, Methods

b) Stadia diaphragm, Stadia formulae.

c) Tachometric contouring.

Unit 2 - Geodetic Surveying

a) Triangulation Principle and Classification, system, Selection of station, Base line,

b) Measurement, Correction and use of sub tense bar.

c) Signals, satellite station, Reduction to center, Trilateration.

Unit 3 - Modern Surveying Equipment's and Project Surveys

a) Principle of EDM, Use and applications of Total Station.

b) Reconnaissance, Preliminary and Detailed survey for road project.

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Unit 4 - Curves

a) Significance of curves and curve setting.

b) Type of horizontal curve, elements of Simple, Compound curve, Transition curve

introduction only, setting out of simple curve by linear and angular methods.

c) Vertical curves – types, lengths of vertical curves.

Unit 5 - Photogrammetry

a) Types of photogrammetry, Terrestrial Photogrammetry-introduction only.

b) Aerial photogrammetry – Scale of vertical photographs, Flight planning.

Unit 6 - Modern methods of surveying:

a) Remote sensing - Definition, relevance, types, electromagnetic radiation and

energy sources and its characteristics, applications to civil engineering.

b) GPS - basic principles, GPS segments, receivers, applications in survey.

c) GIS - Terminology, advantages, basic components of GIS, data types, GIS analysis, applications of GIS software.

Fluid Mechanics-II

Unit-1: Uniform Flow in Open Channel

A. Introduction, Difference between Pipe Flow and Open Channel Flow. Types of Open

Channels, Types of Flows in Open Channel, Geometric Elements, Velocity

Distribution, Measurement of Velocity- (Pitot tube, Current Meter)

B. Steady and Uniform Flow: Characteristics of uniform flow, Chezy's and Manning's

Formula, Uniform Flow Computations, Hydraulically Efficient Section (Rectangular, Triangular, Trapezoidal)

Unit -2: Gradually Varied Flow (GVF)

A. Depth Energy Relationship in Open Channel Flow: Specific Energy (Definition and

Diagram, Critical, Sub-Critical, Super-Critical Flow), Specific Force (Definition and Diagram)

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B. Gradually Varied Flow (GVF): Definition, Classification of Channel Slopes,

Dynamic Equation of GVF (Assumption and Derivation), Classification of GVF

Profiles- Practical Examples, Direct Step Method of Computation of GVF Profiles.

Unit-3: Rapidly Varied Flow (RVF)

A. Rapidly Varied Flow (RVF): Definition, Hydraulic Jump- Phenomenon, Conjugate

Depth Relationship, Characteristics, Hydraulic Jump (uses, types,

location and

application) ,Hydraulic Jump as an Energy Dissipater, Surges in open channel-

Positive and Negative Surge.

B. Spatially Varied Flow: Introduction, Basic Principles and Assumptions.

Unit-4: Notches and Weirs

Types, Derivation of Discharge Equation, Velocity of Approach, Francis Formula,

Calibration of Notches, Errors in Measurement of Discharge, Sharp, Broad and Round

Crested Weirs, Calibration of Weir, Time of Emptying Tank with Weir.

Unit-5: Impact of Jet:

Impulse Momentum Principle, Impact of Jet on Vanes- Flat, Curved (Stationary and

Moving), Inlet and Outlet Velocity Triangles, Series of Flat, Curved Vanes Mounted on

Wheel.

Unit-6: Pumps and Turbines:

A. Hydraulic Turbines: Importance of Hydro-Power, Classification of Turbines-

Pelton, Francis and Kaplan Turbine (Detailed Design Need Not To Be Dealt With),

Unit Quantities, Specific Speed, Performance Characteristics,

Selection of Type of Turbine, Concept of Draft Tube.

B. Centrifugal Pump: Classification, Component Parts, Working of Centrifugal Pump,

Performance Characteristics, Common Pump Troubles and Remedies, Net Positive

Suction Head (NPSH).

BUILDING DESIGN AND DRAWING

Unit: 1 Site Selection criteria: Principles of Building planning, Significance Sun path diagram, Wind Diagram, Orientation, Factors affecting, criteria under Indian condition.

Unit: 2 Building Planning Byelaws and regulations: As per SP-7, 1983 National Building code of India group 1 to 5.

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Planning of Residential Building: (Bungalows, Row Bungalows, Apartments and Twin Bungalows) Procedure of Building Permission, the significance of commencement, plinth completion or occupancy certificate.

Unit: 3 Low-cost Housing: Materials and Methods (conceptual introduction only)

Maintenance, Repairs, Rehabilitation of Structures: (Conceptual introduction only)

Green building: Concept and rating.

Unit: 4 Plumbing system: Various Materials for system like A-PVC, C-PVC, GI, and HDPE. Various types of traps, Fittings, Chambers, Need of Septic Tank, Concept of Plumbing and Drainage plan, introduction to rainwater harvesting.

Electrification: Concealed and Open Wiring, Requirements and Location of various points, Concept of Earthing.

Fire resistance in building: Fire protection precautions, confining of fire, fire hazards, Characteristics of fire resisting materials, building materials and their resistance to fire.

Unit: 5 Ventilation: Definition and necessity of Ventilation, functional requirement, various system and selection criteria.

Air conditioning: Purpose, Classification, Principles, Systems and Various Components of the same.

Thermal Insulation: General concept, Materials, Methods.

Introduction to Acoustics: Absorption of sound, various materials, conditions for good acoustics.

Sound Insulation: Methods of noise control.

Unit: 6 Paints: Different types and application methods.

Plastering: Pointing and various techniques.

Wall cladding: Skirting, dado work with various materials.

Miscellaneous finishes: POP, Gypsum plaster.

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