Civil Engineering

Engineering Mechanics: System of forces, free-body diagrams, equilibrium equations; Friction and its applications: Kinematics of point mass and rigid body; Impulse-momentum; Energy methods; Principles of virtual work.

Strength of Materials: Simple Stress and Strain, Elastic constants, axially loaded compression members, Shear force and bending moment, theory of simple bending, Shear Stress distribution across cross sections, Deflection of beams: Macaulay's method, Mohr's Moment area method, Conjugate beam method, unit load method, Torsion of Shafts, Elastic stability of columns, Euler's Rankine's and Secant formulae.

Structural Analysis: Statically determinate and indeterminate structures by force/ energy methods; Analysis of trusses, arches, beams, cables and frames; Displacement methods: Slope deflection and moment distribution methods; Influence lines; Stiffness and flexibility methods of structural analysis.

Steel Structures: Principles of working stress method. Design of connections, simple members, Built-up sections and frames, Design of Industrial roofs. Principles of ultimate load design. Design of simple members and frames.

Concrete Structures: Working stress, Limit state and Ultimate load design concepts; Design of beams, slabs, columns; Bond and development length; Analysis of beam sections at transfer and service loads. Design of brick masonry as per I.S. Codes. Pre stressed concrete - types, losses and applications.

Fluid Mechanics: Properties of fluids, fluid statics; Continuity, momentum, energy and corresponding equations; Potential flow, applications of momentum and energy equations; Laminar and turbulent flow; Flow in pipes, pipe networks; Concept of boundary layer and its growth. Dimensional Analysis and Similitude: Buckingham's Pi-theorem.

Hydraulic Machines: Hydraulic turbines, classification, Choice of turbines, performance parameters, controls, characteristics, specific speed. Centrifugal pumps – Types, characteristics, specific speed, Reciprocating pumps - Air vessels.

Soil Mechanics: Properties of soil, classification and interrelationship; Compaction behaviour, methods of compaction and their choice; Permeability and seepage, flow nets; Compressibility and consolidation; Shearing resistance, stresses and failure; soil testing in laboratory. Earth pressure theories, stress distribution in soil.

Foundation Engineering: Soil exploration, samplers, load tests, penetration tests, Types of foundations, Selection criteria, bearing capacity, settlement, laboratory and field tests; Types of piles and their design and layout, Foundations on expansive and swelling soils.

Engineering Materials: Physical properties of construction materials with respect to their use in construction - Stones, Bricks and Tiles; Lime, Cement, different types of Mortars and Concrete. Specific use of Ferro cement, fibre reinforced C.C, High strength concrete. Timber, properties and defects - common preservation treatments. Use and selection of materials for specific use like Low Cost Housing, Mass Housing, High Rise Buildings.

Concrete Technology: Importance of W/C Ratio, Strength, ingredients, workability, testing for strength, elasticity, non-destructive testing, mix design methods.

Construction Planning and Management: Construction activity - schedules- organization for construction industry - Quality assurance principles. Use of Basic principles of network - analysis in form of CPM and PERT - their use in construction monitoring, Cost optimization and resource allocation. Basic principles of Economic analysis and methods. Project profitability - Basic principles of Boot approach to financial planning - simple toll fixation criterions.

Surveying: Common methods of distance and angle measurements, plane table survey, levelling, traverse survey, triangulation survey, corrections, and adjustments, contouring, topographical map. Surveying instruments for above purposes Tacheometry. Circular and transition curves; Principles of photogrammetry, Remote Sensing, GIS, Applications.

Highway Engineering: Principles of highway planning, Highway alignments, Geometrical design: Cross section, camber, super elevation, horizontal and vertical curves. Classification of roads: low cost roads, flexible pavements, rigid pavements.

Traffic Engineering: Forecasting techniques, origin and destination survey, highway capacity, Channelised and unchannelised intersections, rotary design elements, markings, sign, signals, street lighting; Traffic surveys, Principle of highway financing.

Railway Engineering: Railways - Permanent way - components, types and their functions - Functions and Design constituents of turn and crossings - Necessity of geometric design of track - Design of station and yards.

Airport Engineering: Airports - Layout and orientation; Runway and taxiway design and drainage management; Zoning laws; Visual aids and air traffic control; Helipads, hangers, service equipment.

Hydrology: Hydrologic cycle, precipitation, evaporation, evapo-transpiration, watershed, infiltration, unit hydrographs, hydrograph analysis, flood estimation and routing, reservoir capacity, reservoir and channel routing, surface run-off models, ground water hydrology - steady state well hydraulics and aquifers; Application of Darcy's law.

Irrigation Engineering : Duty, delta, Crop water requirements; Design of lined and unlined canals, head works, gravity dams and spillways; Design of weirs on permeable foundation; Types of irrigation systems, irrigation methods; Water logging and drainage; Canal regulatory works, cross-drainage structures, outlets and escapes.

Water Supply Engineering: Predicting demand for water, impurities of water and their significance, physical, chemical and bacteriological analysis, waterborne diseases, standards for potable water, different sources of water supply and selection of intake, pump design for intake, water losses and thefts, water distribution systems, water treatment: sedimentation, flocculation, chlorination, primary, secondary and tertiary treatment, advanced water treatment techniques like RO

Waste Water Engineering: Urban rain water disposal; Systems of sewage collection and disposal; Design of sewers and sewerage systems; pumping; Characteristics of sewage and its

treatment, Disposal of products of sewage treatment, stream flow rejuvenation Institutional and industrial sewage management; Plumbing Systems; Rural and semi-urban sanitation.

General aptitude: Verbal Ability: English grammar, sentence completion, verbal analogies, word groups, instructions, critical reasoning and verbal deduction. Numerical Ability: Numerical computation, numerical estimation, numerical reasoning and data interpretation

General knowledge / General awareness: General science: fundamentals related to physics, chemistry, biology and daily science ; Static GK: static topics like Indian Politics, History and Culture, Economy, Geography, etc.; current affairs: recent development in Sports, Awards, Politics, Finance and Banking sector, International happening, etc. ; including other topics related to National Schemes, Computers, Book Names and Authors, Logical Analysis, Important Days, etc.