

602. CIVIL ENGINEERING

1. STRUCTURAL ENGINEERING

- a) Strength of Materials: Simple Stress and Strains, elastic constants, shear forces and bending moment diagrams for beams, principal stresses and Mohr's stress circle, bending and shear stresses, deflections, torsion, thin and thick cylinders and fixed beams, shear centre, trusses, Betti-Maxwell theorem, unsymmetrical bending.
- b) Theory of Structures: Direct and bending stresses, Columns, Strain energy, Moving loads and influence lines, Arches, Suspension bridges – static and kinematic indeterminacy, Moment distribution, Slope deflection and Kani's methods applied to continuous beams and portal frames, column analogy, matrix methods.
- c) Concrete Technology: Material properties, Concrete properties, Basics of Mix design.
- d) Concrete Structures: Materials and stresses, IS 456-2000, stress blocks limit state and working stress methods of design of Beams, Slabs, Columns and Footings. Retaining walls, water tanks, Slab and T-Beam bridges, design for shear and torsion, yield line theory.
- e) Steel Structures: Bolted and welded joints and connections, simple and compound columns, column bases, Tension members, roof trusses, plate and gantry girders, plate girder and lattice girder railway bridges and bearings. Plastic analysis and design of beams and frames.
- f) Pre-stressed concrete: Basic concepts, material losses, system of pre-stressed analysis and design of beams.

2. GEOTECHNICAL ENGINEERING

- a) Soil Mechanics: Physical properties of soils, Classification and Identification, Permeability, Capillarity, Seepage, Compaction, Consolidation, Shear strength, Earth pressure, Slope stability and advances in soil mechanics.
- b) Foundation Engineering: Stress distribution in soils, Bearing capacity, Settlement analysis, Pile foundations, Cofferdams, Caissons, Dewatering, Bracing for excavations, Site investigations, Newmark charts, machine foundations.
- c) Engineering Geology: Mineralogy, Structural Geology Groundwater Earthquake Engineering, Tunnels, Dams and Reservoirs, rock mechanics, Geological hazards.

3. HYDRAULICS AND WATER RESOURCES ENGINEERING

- a) Fluid Mechanics: Basic concepts, Fluid Statics, Kinematics and Dynamics, Energy Principles, Flow Measurement, Compressible flow, Flow Through pipes, Open channel flow, Similitude Concepts and applications, Hydraulic machines-Turbines and pumps.
- b) Hydrology: Rainfall, Runoff, Floods, Groundwater, hydrographs, flood control and mitigation.
- c) Irrigation: Diversion Head Works, Canals, Crop water requirement, Soil agronomy, Water management, weirs, cross drainage works, canal falls.
- d) Dam Engineering: Storage works, Dams, Spillways, Energy dissipation, Earthen dams.
- e) Water Power: Development, Power House Components and dimensions.

4. TRANSPORTATION ENGINEERING

- a) Highway alignment, Geometric design, Traffic Engineering, Pavement material characterization, pavement design: flexible pavements, rigid pavements and advanced design approaches like mechanistic methods of pavement design, pavement maintenance, pavement evaluation and highway drainage
- b) Railway Engineering: History, alignment, geometrics, rails, sleepers, ballast sub-grade preparation, curves, crossings etc.
- c) Airport Engineering: Airport planning, runway orientation and design, design of taxi ways and other geometric components.
- d) Traffic and Transportation planning and management

5. OTHER IMPORTANT TOPICS

Elements of Surveying: Plane table, compass, Leveling and theodolite survey; Building materials and technology; Elements of estimation & costing. Environmental Engineering: Water and Waste Water Engineering, Air Pollution, Municipal Solid Waste, Noise Pollution
CPM and PERT, contracts and tenders, Building Information Modelling and Multicriteria Decision making Models (BIM & MCDM Models), remote sensing and GIS. GPS, Applications of Geospatial Techniques to Civil Engineering.
