CIVIL ENGINEERING

Structural Engineering: Mechanics: Stress-Strain Relationships – Principal stresses and Principal strain in two dimension and three dimension. Composite Bars – Composite Beams – Elastic Constants. Beams and Bending – Shear Force and Bending Moment Diagrams – Flexural and shear Stresses. Slope and Deflection of Beams. Thin and Thick Cylinders. Torsion. Theories of Failure – Unsymmetrical Bending – Curved Beams – Theories of Columns. Combined Direct and Bending Stresses.

Structural Analysis: Static and Kinematic Indeterminacy – Energy Principles – Deflection of pin jointed plane frames – rigid frames. Classical Method of Analysis of indeterminate structures (Slope deflection and Moment Distribution) – Matrix Method. Arches and Suspension Bridges – Influence Line for Determinate and Indeterminate Structures. Plastic Analysis of Structures.

Building Materials: Cement – Concrete – properties of ingredients – Mix Design – Quality Control – Special Concrete – Concreting Methods – Brick – Brick Masonry – Stone – Timber – Steel. Concrete Structures: Design Methods – Limit State Design for beams, slabs, columns and footings – retaining walls – water Tanks. Prestressed Concrete – Principles – Methods – Losses – Deflection – Design. Steel Structures: Steel Sections – Connections – Design of Tension and Compression Members – Beams, Column Bases – Plate Girders and Trusses.

Soil Mechanics and Foundation Engineering:

Soil Mechanics: Nature of soil – phase relationships – soil classification; Soil water – static pressure – effective stress principle; permeability – seepage; Stress distribution in soil – Consolidation (Terzaghi's one-dimension consolidation theory); Compaction shear strength of soil – Mohr - Coulomb theory – determination of shear strength by different methods; Slope stability analysis – protection measures.

Foundation Engineering: Site investigation – scope and objectives – drilling techniques – depth and spacing of boreholes – sampling techniques – penetration tests (SPT and SCPT) – plate load test – selection of foundation; Foundation types – shallow foundation – bearing capacity (Terzaghi's Theory and BIS formula) – allowable bearing pressure – bearing capacity from field tests – settlement of foundation – allowable settlement – Codal provisions; Design of foundations – Isolated, combined and raft foundation; Pile foundations – static and dynamic pile driving formulae (Engineering News and Hiley method) – Pile groups – capacity and settlement – Codal provisions – pile load test – negative friction on piles; Earth pressure theories – Earth pressure on retaining walls – stability analysis of retaining wall.

Transportation Engineering: Highway Planning: Transportation Engineering: Highway Planning: Road Classification, Highway Alignment studies, Geometric Design of Highway, Hill Roads, Design and construction of flexible and rigid pavements. Pavement Distress and maintenance, Railways, Airways, Docks and Harbour Planning: Railway alignment, site selection, components of permanent way, geometric design, signalling, station and yards. Airport planning, components of airport, planning for terminal building, Runways orientation and correction for length, Taxiway design. Harbour planning, components of harbour, site selection, inland water transport, coastal protection structure, coastal Regulation Zones. Traffic Engineering and Management: Traffic characteristics, Traffic surveys, Traffic Signals, Road markings and signs, Roundabouts, Traffic safety and Traffic management.

Water Resources Engineering: Fluid Mechanics and hydraulics: Properties of fluids. Fluid statics and relative equilibrium. Basic concepts of fluid flow – kinematics and dynamics. Concept of system and control volume application to continuity, momentum and energy equations. Dimensional analysis and model studies. Laminar and turbulent flow through pipes. Boundary layers. Steady uniform and

gradually varied flow in open channels. Rapidly varied flows. Turbines and pumps and positive displacement pumps.

Hydrology and Ground Water: Hydrometeorology. Hydrologic cycle. Precipitation and its measurements. Abstractions. Runoff estimation. Hydrograph analysis. Unit Hydrograph. Hydrologic extremes flood and droughts. Rainwater harvesting. Properties of aquifer. Groundwater development. GEC norms. Well hydraulics. Steady and unsteady flows. Ground water quality. Irrigation Engineering: Irrigation system. National water policy. Components of irrigation network. Design of lined and unlined channels. Waterways, head works, gravity dams and spillways. Design of weirs on permeable foundation. Soil water relations. Crop water requirements. Irrigation scheduling and methods. Duty, delta and base period. Irrigation water quality. Irrigation water management. Participatory approach.

Environmental Engineering: Water and waste water Engineering; Water requirements; water demand; quality standards; Development of water supply source, conveyance system; basic unit processes and operations for water treatment; water distribution; sewage characteristics; sewage treatment, primary and secondary treatment of sewage, sludge disposal, sewage disposal. Air Pollution and Control: Types of Pollutants, their sources and impacts, air pollution meteorology, air pollution control, air quality standards and limits. Noise pollution and Control: Impacts of noise, permissible limits of noise pollution, measurement of noise and control of noise pollution.

Surveying: Chain surveying, compass surveying, plane table surveying, leveling, theodolite surveying Temporary and permanent adjustments for level and theodolite, trigonometric leveling, tacheometry, traversing, contouring, Computation of areas and volumes, Curve setting, simple, compound and reverse curves, transition curves, vertical curves construction surveying, hydrographic surveying, route survey, triangulation , astronomical survey, Electromagnetic distance measurement, Total station and GPS surveying, adjustment of errors in surveying, least square adjustment, weights of observations.