CIVIL ENGINEERING

(Preliminary) ← D

SECTION - A

Engineering Mechanics : -

Units and Dimensions, vectors; Equations of Equilibrium, free body diagram, virtual work, Force distribution system. Velocity and acceleration in Cartesian and Curvilinear coordinates, equation of motion, Principle of Energy, conservation of energy and momentum, rotation of rigid bodies about fixed axis, Mass moment of Inertia.

Isotropic and homogenious elastic material, stress and strain, temperature stresses, principal stresses and strains Mohr's circle, elastic constants and their relationship. Shear force and bending moment diagrams, Theory of simple bending, Distribution of shear stress, deflection of beams and tresses, Macaulay's method; Conjugate beam method; columns and struts, stability and critical loads.

Torsion - Torsion of circular shafts, combined bending, torsion and axial thrust. Strain energy, shear stress, bending and torsion.

Theory of structures : -

Energy theorems, unit load method and method of consistent deformations for calculation of deflections in Beams & Trusses.

Methods of solution of Indeterminate structures like Beams & Plane frames, slope-deflection method and moment-distribution method. Force and displacement methods of matrix method for analysis of frames and trusses.

Three hinged & two hinged arches, Moving load effect on Arches & Beams, Influence line methods.

Design of Reinforced Concrete Structures : -

Working stress and limit state methods of design, IS code 456, Design of one way and two way slabs, Design of singly, Doubly reinforced beams of rectangular, T & L Sections. Design of compression numbers under axial load and uniaxial moment by limit state method. Design of Isolated and combined footings in R. C.

Structural Steel Design : -

Design of fasteneres, like welded & bolted joints, Design of tension and compression members in mild steel, Design of simple and built up beams and plate ginders. Design connection for shear & moment transfer in welding. Design of plane trusses & connections.

Building Construction & Planning : -

Physical and mechanical properties of construction materials like Brick, Cement, Steel and lime. Damp and water proofing materials. Factors of safety, servicibility and detailing of structural elements and stair cases. Provisions for fire proofing and earthquake resistance in building construction.

Construction scheduling. PERT & CPM methods.

Fluid Mechanics

SECTION - B

Properties of fluids, Fluid statics, Pressure on plane and curved surfaces, buoyancy, metacentric height.

Kinematics of fluid flow, Steady, uniform, laminar and turbulent flow. Equation of Continuity, Pathlines and stream lines, Velocity potential and stream function, Flow net, separations.

Dynamics of Fluid flow : Momentum equation, Bernoullis theorem, pipe flow and free surface flow, free and forced vortex.

Measurement of flow : Pitot tube, piezometer, current meter, orifices, mouth pieces.

Flow through pipe : Losses and pipe network, water hammer.

Open Channel Flow : Hydraulic gradients, Equation for uniform flow, specific energy critical depth, Velocity distribution, flow in Contracting transitions, weirs, Hydraulic jump. Surface profiles.

Dimensional Analysis : Buckingham, Pi theorem dimensionless parameter, similarities undistorted and distorted models, Boundary layer on a flat plate, drag and lift on bodies.

Pumps and Turbines : Types, Impulse and Reaction, efficiency, specific speed, Characteristic curves. Selection.

Hydrology : Hydrologic cycle; precipitation; evaporation - tanspiration and infiltration hydrographs; unit hydrographs. Elements of water Resources planning and management. Ground and surface water resources; surface flows. Single and multipurpose projects storage capacity, reservoir losses, reservoir silting.

Water requirements for crops : quality of irrigation water, consumptive use of water, water depth & frequency of irrigation; duty of water; irrigation methods and efficiences. Unlined channels in alluvium; critical tractive stress; regime theories; lined channels. Hydraulic design & cost analysis.

Distribution system for Canal irrigation - determination of required Channel capacity, channel losses. Alignment of Channels. Water logging - causes and control; design of drainage system; soil salinity. Canal structures - design of regulation work; cross drainage works, falls, aqueducts, metering flumes etc. Canal outlets.

Diversion Headworks - Principles of design of different parts on impermeable and permeable foundations; Khosla's theory; sediment exclusion. Elements of River training. Storage works - Types of dams (including earth dam) - characteristic principles of design, criteria for stability. Foundation treatment - Joints and galleries. Control of seepage. Spillways - different types and their suitability, energy dissipation; spillway crest gates.

Surveying

SECTION - C

General principles, chain surveying, campass traversing, bearings local attractions, Types of Traversing, Traverse computations, corrections and missing readings.

Levelling : Theory of levelling, Temporary and permanent adjustments of levels, automatic levels, Types of levelling, reciprocal levelling, L-Section and cross section. Refr. & Curvature Correlation.

Contouring : Characteristics, uses and plotting of contours.

Plane Table Survey : Introduction, Orientation, Plotting methods, Two and Three point problems, solution, Lehmann's rule.

Theodolite : Adjustments (Temp. & Perm.), Measurement of angles.

Trigonometric Levelling : methods and uses.

Tacheometric Survey : Distances and elevation, subtense Bar, Autoreduction Tacheometer.

Curves : Horizontal and Vertical curves, their design and layout. Reverse and Transition curves.

Triangulation : Theory and applications, Base line measurement, corrections, Strength of figure, Intervisibility of stations, Satellite and Supplimentary Stations.

Hydrographic Surveying : Location of Soundings and depth determination. Introduction to oceanographic surveying.

Theory of Errors and Adjustment of Observations : Determination of most probable values of quantities, probable errors. Theory of least squares, Correlative normal equations, Adjustment of geodetic quadrilaterals, Centred polygons and level nets.

Astronomical Surveying : Celestial coordinates, solution of spherical triangles, determination of Azimuth, latitude, longitude and time.

Photogrammetry and Photointerpretation : Aerial Photogrammetry, Basic definitions of photogrammetry, Radial line plotting, stereophotogrammetry, Flight Planning Determination of heights etc. Application of photointerpretation in Civil Engg.

Remote Sensing : Introduction, EMR and its spectrum, Introduction to visual and digital interpretation of the satellite data products. Basic definitions.

SECTION - D

Geotechnical Engineering :

Origin classification and identification of soils, phase relationships, index properties, laboratory determination.

Capillary phenomenon and permeability, flow though porous media, seepage forces, flownet, flow through stratified deposits and earth dams.

Consolidation, Terzaghi's theory of one dimensional consolidation, compaction, tests, applications.

Stresses in soil, total and effective stresses, shear strength, pore pressure coefficients, Mohr Circle, Mohr-Coulomb theory, Laboratory tests.

Earth pressure theories, analytical and graphical methods. Retaining walls, sheet piles.

Stability of slopes, methods of analysis, Taylor's stability number.

Foundation Engineering :

Sub-surface investigations, boring and sampling, types of samples, standard penetration test.

Stress distribution beneath loaded area, use of influence charts, shallow foundation, bearing capacity, Terzagi, Skempton and Hansen's methods, deep foundations, BIS codes. Settlement analysis.

Machine foundations, foundation isolation, earthquake effects, liquifaction.

SECTION - E

Transportation Engineering :

Classification of Roads, Geometric design, flexible and rigid pavements Traffic Engg., Road signs, signals and markings.

Permanent way, Points and crossings, turn outs, Maintenance of track, Yards, and Stations Signals and interlocking.

Airports and Runways

Environmental Engg. :

Elementary Principle of ecology, Environment and its effect on human healths. Engineering activities and environmental pollution.

Air Environment : Major pollutants and their adverse effects, air cleaning devices. Water quality : Parameters, adverse effects, purification of streams. Solid Wastes; Typical features of water distribution systems & Sewarage systems. Environmental Management.