

## 1. Building Technology And Construction Management

Building Materials: stones, bricks, steel, timber, cement, sand, aggregates for cement concrete, paints, distempers, use of pozzolana in the making of lime concrete, cement concrete or plain, reinforced and pre-stressed concrete work.

Road Materials: Coarse aggregate, screenings, bitumen binders, materials for WBM, Bricks for soling, Coarse and fine aggregate for bituminous roads, standard size aggregates, Tars and Asphalt. Asphaltic concrete. Asphaltic emulsions, Mastic Asphalt and Mineral fillers

Construction Management: Planning and organization. Planning for construction using network analysis CPM and PERT techniques

## 2. Fluid Mechanics

Fluids : Definition, Ideal fluids, real fluids. Newtonian and non-Newtonian fluids.

Properties of Fluids: Units of measurement, Mass density, Specific weight, Specific volume, Specific gravity, Viscosity, Surface tension and Capillarity, Compressibility and Elasticity.

Hydrostatics: Pressure at a point in a static fluid; pressure variation in an incompressible static fluid; atmospheric pressure, Gauge pressure, vacuum pressure, absolute pressure, Manometers Bourdon pressure gauge.

Buoyancy: Forces acting on immersed plane surface. Centre of pressure, forces on curved surfaces. Conditions of equilibrium for floating bodies, metacentre and metacentric height experimental and analytical determination of metacentric height.

Equilibrium of fluid particles and flow: fluid mass subjected to horizontal and vertical acceleration and uniform rotation.

Hydro-kinematics: 3 types of flows: Steady and Unsteady, uniform and non-uniform, streamlines, stream tubes, principles of conservation of mass, equation of continuity, acceleration of fluid particles local and convective, Rotational and irrotational motions. Free and forced vortex, circulation and circulation velocity potential and stream function, elementary treatment of flow net. Euler's equations of motion and integration of Euler's equations, Bernoulli's equation for incompressible fluids, assumptions in Bernoulli's equation. Friction correction factor.

Applications of Bernoulli's equation: Pitot tube, Venturi meter, orifice meter, orifices & mouth pieces, time of emptying of tanks by orifices, sharp edged rectangular, triangular and trapezoidal notches, Francis formula. Velocity of approach. Head contractions Cippoletti Weir, time of emptying reservoirs by Weirs.

Momentum Equation and its Application: Derivation of momentum equation by control volume concept, momentum correction factor, application to Borda's mouth pieces, sudden enlargement of flow. pressure on flat plates, Nozzles.

Flow Through Pipes: Laminar flow, Reynolds experiment, transition from laminar to turbulent flow. Turbulent flow: Laws of fluid motion, friction factor Moody's diagram, loss of head due to friction and other causes. Hydraulic gradient. total energy line Chezy's, Darcy's and Manning's formula. flow through parallel pipes and pipes in series. flow through branched pipes. Flow along a bypass. flow transmission through pipe, condition for maximum power. Elementary water hammer concept.

## 3. Surveying & Field Engineering

**Introduction:** Importance of surveying to engineers, Plane and Geodetic surveying, methods of location of points, principle of surveying from whole to part, conventional signs.

Measurement of Distances: Different types of chains, tapes and their uses. Sources of error and precautions, corrections to tape measurements. Field problems in distance measurement. Advanced techniques of distance measurement.

**Measurement of Angles & Direction:** Different types of direction measuring instruments and their uses. True meridians, bearing and azimuths, magnetic declination and its variation. Use and adjustment of surveyors and prismatic compass.

Vernier and *micro* optical theodolite, temporary and permanent adjustment

Measurement of horizontal and vertical angle by different methods. Application of theodolite in field problems.

**Traversing:** Different methods of traversing; chain transit, SC, G121112 & G01T1, tacheometry, transit-tape traverse. Methods of computations and adjustment of traverse; triangulation, Bowditch rule, graphical method, axis method. (also traverse table).

**Leveling:** Definitions of various terms in leveling. Different types of leveling, sources of error in leveling, curvature and refraction corrections. Temporary and permanent adjustment of dumpy level and tilting levels. Computation and adjustment of level. Profile leveling, L-Section and cross-sections.

**Plane Table Surveying:** Elements of plane table surveying operations, methods of plane table survey; intersection, traversing and resection. Two point and three point problems.

**Contouring:** Characteristics of contours, contour interval, contour gradient, Methods of locating contour's, uses of contour maps.

**Trigonometric Leveling:** Trigonometric leveling, Objects accessible and non accessible, Determination of levels of objects when.

**Field Astronomy:** Definitions of terminology used in Astronomy,

Introduction to Remote Sensing and THIS Instrumentation for quantities for various types of construction, Data Analysis, Preparation of Tender & contract documents. Centre-line diagrams, Building layout.

#### **4. Irrigation & Water Resources**

Introduction, necessity, benefits, types and methods of irrigation, Hydrology — Measurement of rainfall, runoff coefficient, rain gauge, losses from precipitation evaporation, infiltration, etc. Water requirement of crops, duty, delta and base period, Kharif and Rabi Crops, Command area, Time factor, Crop ratio, Overlap allowance, Efficiency of canals, types of canal irrigation, loss of water in canals. Canal lining-types and advantages. Shallow and deep wells, yield from a well. Weir and barrage, Failure of weirs and permeable foundation, Silt and Scour, Kennedy's theory of critical velocity, Lacey's theory of uniform flow. Definition of flood, causes and effects, methods of flood control, water logging, preventive measures. Land reclamation, Characteristics of affecting fertility of soils, purposes, methods. description of land reclamation processes. Major irrigation projects in India.

#### **5. Theory of Structures and Strength of Materials**

Elasticity constants, types of beams — determinate and indeterminate. Bending moment and shear force diagrams of simply supported, cantilever and overhanging beams. Moment of area and moment of inertia for rectangular & circular sections, bending moment and shear stress for tee, channel and compound sections, chimneys, dams and retaining walls, Eccentric loads, slope deflection of simply supported and cantilever beams. critical load and columns. torsion of circular section, Springs, Vibration.

#### **6. Structural Analysis**

Introduction to Indeterminate structures. Degrees of freedom per node, Static and Kinematic indeterminacy (i.e. for beams, frames & portal with & without sway etc.), Releases in structures, Maxwell's reciprocal theorem and Castigliano's theorem, Analysis of Statically Indeterminate Structures using Slope - deflection method. Analysis of structures using Moment-distribution method applied to continuous beams and portal frames with and without inclined members. Unit load method & their Applications deflection of determinate beams and frames, analysis of determinate and redundant frames up to two degree of redundancy, lack of fit in redundant frames.

## 7. Soil Mechanics and Foundations Engineering

Origin of soil phase diagram, Definitions-void ratio, porosity, degree of saturation, water content, specific gravity of soil grains, unit weights, density index and relationship of different parameters, Grain size distribution curves and their uses, Index properties of soils, Atterberg's limits, IS soil classification and plasticity chart, Permeability of soil, coefficient of permeability, determination of coefficient of permeability, Unconfined and confined aquifers, effective stress, quick sand, consolidation of soils, Principles of consolidation, degree of consolidation, pre-consolidation pressure, normally consolidated soil,  $e$ - $\log p$  curve, computation of ultimate settlement. Shear strength of soils, direct shear test, Vane shear test, triaxial test. Soil compaction, Laboratory compaction test, Maximum dry density and optimum moisture content, earth pressure theories, active and passive earth pressures, bearing capacity of soils, plate load test, standard penetration test.

## B. Design of R.C. Concrete and Masonry Structures

RC beams-flexural strength, shear strength, bond strength, design of singly reinforced and double reinforced beams, cantilever beams, slabs, lintels. One way and two way slabs, isolated footings. Reinforced brickwork, columns, staircases, retaining wall, water tanks (RCC design questions may be based on both Limit State and Working Stress methods)

**Concrete Technology** : Properties, Advantages and uses of concrete, cement aggregates, importance of water quality, water-cement ratio, workability, curing, storage, batching, mixing, placement, compaction, finishing and curing of concrete, quality control of concrete, hot weather and cold weather concreting, repair and maintenance of concrete structures.

## 9. Design of Steel Structures

**Steel Design**: Steel design and construction of steel columns, beams and stiffened plate girders.

## 10. Construction Technology

Stone and Brick Masonry. Ashlar, course and random rubble, stone pillar, dry stone and arch masonry, brick bonds and type of walls.

**Lintels**: Plastering, pointing, flooring, Expansion and construction joints. Centring and shuttering, General Selection criteria of site, Planning and orientation of buildings.

**Roofing**: Stone slab, RCC, G.C. Steel, Asbestos cement and jack arch roofing.

**Flooring**. Cement concrete, flag stone, terrazzo mosaic, terrazzo tile, Erick on edge, Timber Granolithic, linoleum and other floorings.

Plastering: Lime, cement sand, composite and organic coat plaster, Plaster of Paris, painting, Damp proof course, anti-termite treatment.

Centring and **Shuttering**: Centring form work, shuttering and moulds, timber & steel trestles and false work, scaffolding and shoring, underpinning.

## 11. Auto-Cad Civil Engineering Drawings

## भाग-ब :- सिविल अभियांत्रिकी (डिप्लोमा)

### 1. Building Technology And Construction Management

Physical and Chemical properties, classification, Standard tests, uses and manufacture/quarrying of materials e.g. building stones, silicate based materials, cement (1\*onland), asbestos products. timber and wood based products, Varnishes, bituminous materials, paints, varnishes.

### 2. Surveying, Estimating & Costing

Principles of surveying, classification of distances. chain surveying. working of prismatic compass, compass traversing, bearings. local attraction, plane table surveying, theodolite traversing, adjustment of theodolite. Leveling, definition of terms used in leveling, contouring, curvature and refraction corrections, temporary and permanent adjustments of dumpy level. methods of contouring, uses of contour map, tachometric stationing, curve setting, earth work calculation, advanced surveying equipment. Estimate, glossary of technical terms, analysis of rates, methods and unit of measurement. Items of work earthwork. Brickwork (Cinder & First-class bricks), RCC work, Shuttering, Timber work, Painting, Formwork, Plastering. Boundary wall, Brick masonry, Water Tank, Septic tank, Bar bending schedule, Centre line method, Noida formula, Trapezoidal formula, Simpson's rule. Cost estimate of Septic tank. flexible pavements, Vibration well, isotopes and combined footings, Steel truss, Piles and pile-caps. Valuation - Value and cost, scrap value, salvage value, assessed value. sinking fund, depreciation and obsolescence, methods of valuation.

### 3. Strength of Materials

Elasticity constants, types of beams — determinate and indeterminate. bending moment and shear force diagrams of simply supported, cantilever and overhanging beams. Moment of area and moment of inertia for rectangular & circular sections. bending moment and shear stress for tee, channel and compound sections, chimney's. dams and retaining walls, eccentric loads, slope deflection of simply supported and cantilever beams, critical load and columns, torsion of circular section.

### 4. Reinforced Concrete Design

UC beams—flexural strength, shear strength, bond strength, design of singly reinforced and double reinforced beams, cantilever beams. T-beams. One way and two way slabs, isolated footings. Reinforced brickwork, columns, staircases, retaining wall, water tanks (RCC design questions may be based on both limit state and working stress methods).

### 5. Irrigation & water resources

Introduction, necessity, benefits, types and methods of irrigation, hydrology Measurement of rainfall, run off coefficient. Rainfall, losses from precipitation evaporation. infiltration, etc.

Water requirement of crops, duty, delta and base period, Kharif and Rabi Crops, Command area, Time factor. Crop ratio. Overlap allowance, Irrigation efficiencies.

Different type of canals, types of canal irrigation, loss of water in canals. Canal lining — types and advantages. Shallow and deep wells, yield from a well. Weir and barrage, failure of weirs and permeable foundation, Silt and Scour, Kennedy's theory of critical velocity. Lacey's theory of uniform flow.

Definition of flood, causes and effects, methods of flood control. water logging, preventive measure. Land reclamation. Characteristics of soil affecting fertility of soils. purposes, methods, description of land and reclamation processes. Major irrigation projects in India.

## 6. Soil Engineering

Origin of soil, phase diagram, Definitions-void ratio, porosity, degree of saturation, water content, specific gravity of soil grains, unit weights, density index and interrelationship of different parameters, Grain size distribution curves and their uses.

Index properties of soils, Atterberg's limits, IS I stir I classification and plasticity chart.

Permeability of soil, coefficient of permeability, determination of coefficient of permeability, Unconfined and confined aquifers, effective stress, quick sand, consolidation of soils, Principles of consolidation, degree of consolidation, pre-consolidation pressure, normally consolidated soil,  $e$ - $\log p$  Curve, Compression of ultimate settlement.

Shear strength of soils, direct shear test, Vane shear test, Tri-axial test.

Soil compaction, Laboratory compaction test. Maximum dry density and optimum moisture content, earth pressure theories, active and passive earth pressures, Bearing capacity of soils, plate load test, standard penetration test.

## 7. Auto-Cad Civil Engineering Drawing