

Syllabus for Civil Engineering

CIVIL ENGINEERING (100 Marks)

Unit-I: ENGINEERING MECHANICS

Forces and moments- Vectors and scalars, resultant forces at a point, types of supports, types of loading. Centroid – rectangle, triangle, parallelogram, circle, semicircle, trapezium. Location of centroid of T, L, I, channel, Z sections. built-up sections. Moment of Inertia – T, L, I and built up sections, radius of gyration of built-up sections; Polar moment of inertia of solid and hollow circular sections using perpendicular axis theorem only. Simple stresses and strains - ductile materials-Mechanical properties of materials- Hooke's law - lateral strain-Poisson's ratio-Elastic constants and the relation between them- Composite sections.

Unit-II: STRENGTH OF MATERIALS

Shear force and Bending Moment Diagrams for cantilever, Simply supported and overhanging beams subjected to Point loads and UDL. Theory of simple bending-assumptions-bending equation-bending Stresses-Section Modulus-Shear stress distribution across various sections like rectangular, circular and I - Sections-Torsion-solid and hollow circular shafts subjected to pure torsion – shear stress – distribution in shafts – power transmitted by circular shafts.

Slope and Deflection of cantilevers and simply supported beams by Double Integration method and Deflection of simply supported beams by Macaulay's method – Mohr's theorems for slopes and deflections-Moment area method-Symmetrical loading. Columns and struts-types-slenderness ratio- Euler's and Rankine's formulae for axial loading.

Unit-III: REINFORCED CONCRETE STRUCTURES

Grades of concrete, characteristic strength, Modulus of Elasticity-I.S.456-2000- Philosophy of Limit state design. Limit state of Strength and Serviceability, partial safety factor-design strength of materials and design loads- assumptions.

Analysis and Limit state design of rectangular Beams-Singly, Doubly reinforced and T-beams. Shear in RCC beams - Development length. Slabs-analysis and limit state design of one-way and two-way slabs as per IS.456-2000, Torsion reinforcement. Design of continuous slabs and beams - Deflection check for slabs and beams. Detailing of reinforcement in singly reinforced and doubly reinforced simply supported beams of rectangular sections and lintels, one way and two way slabs.

Columns: Codal provisions of I.S 456-2000 - short and long columns-different shapes-design of short columns by limit state method-long columns- concept, effective length for different end conditions. Footings-Isolated column footings-one way shear and two way shear. Stairs – types.

Unit-IV: SURVEYING

Chain surveying - purpose and principle-offsets - errors and corrections- different operations in chain surveying- obstacles - methods of calculation of area. Compass Surveying - purpose and principle - bearings- traversing using prismatic compass- local attraction - errors. Levelling - definitions - component parts of Dumpy level - errors - Methods of levelling - contouring - characteristics and methods. Theodolite - principles and component parts- fundamental lines and relationship among them - adjustments of theodolite - measurement of horizontal and vertical angles - errors-traverse computations - Bowditch and Transit rule. Tachometry - principle - stadia tachometry - tangential tachometry, Principle and uses of E.D.M, Electronic Theodolite, Total

Station, Global positioning System - Importance, G.I.S – Use and applications in Civil Engineering, Curves - simple curves, elements of simple curve, setting out of simple curves by chain & tape, single & double theodolite method.

Unit-V: HYDRAULICS

Fluid properties - specific weight – mass density-specific gravity - surface tension - capillarity-viscosity. Atmospheric pressure, gauge pressure and absolute pressure. Fluid pressure on plane surfaces - Centre of pressure and total pressure, measurement of fluid pressure using piezo meter and manometers. Types of flows-uniform, non-uniform, steady, unsteady, laminar and turbulent flows. Energies of liquid in motion - continuity equation. Bernoulli's theorem - Pitot tube – Venturi meter. Flow through small and large orifices, coefficients of orifices - C_c , C_v and C_d . Flow through internal, external, convergent and divergent mouthpieces. Types of Notches - rectangular and triangular, flow over notches. Types of Weirs- sharp crested and broad crested-mathematical formulae for discharge- Francis and Bazin's empirical formulae.

Flow through pipes-major and minor losses - Chezy's and Darcy's formulae for loss of head due to friction-HGL & TEL. Flow through open channels-rectangular and trapezoidal - Chezy's formula for discharge – Kutter's and Manning's equation for Chezy's constants-Most economical sections. Reciprocating and Centrifugal pumps (without problems). Classification of Turbines - Kaplan, Francis and Pelton wheel (without problems) -Types and uses of Draft tubes. Hydro-electric installations - components and uses.

Unit-VI: IRRIGATION ENGINEERING

Necessity of Irrigations - Perennial and inundation Irrigation, Flow and Lift Irrigation, Principal seasons - kharif and rabi crops - Duty, delta and base period. Methods of Irrigation - check flooding, basin flooding, Border strip, furrow, sprinkler and drip Irrigations. Hydrology - Rainfall, types of Rain gauges, types of catchments-rainfall and runoff. Measurement of velocity of flow in streams. Classification of Head works - component parts of diversion head works. Weirs and Barrages. Percolation and uplift pressures. Types of Reservoirs - dead storage and live storage.

Storage Head works-different types of dams- gravity dams-low and high dams. Elementary profile of a dam. Failures of gravity dams - drainage galleries. Types of spillways. Earth dams - types, failures and precautions. Phreatic lines and drainage arrangements in earthen dams. Distribution works-classifications and alignment of canals-typical cross section of a canal-berms - balanced depth of cutting- canal lining. Cross drainage works – types and functions. Soil erosion, Types and causes-measures to control erosion.

Unit-VII: TRANSPORTATION ENGINEERING

Importance of transportation engineering- I.R.C. – Classification of roads as per I.R.C., recommended I.R.C. values of camber for different roads. Gradients – Ruling gradient, limiting and exceptional gradient Recommended-I.R.C values of gradients.

Traffic Engg.- Traffic census and its importance, Road intersections- Traffic signs- Informatory signs- Mandatory signs, Cautionary signs. Highway constructions and Maintenance - Purpose of road drainage- surface and sub-surface drainage, Typical cross section of highway in cutting and embankment. Water bound macadam roads, Cement concrete roads. Permanent way of Railways, Importance of Railways- Gauge, Types of gauges, Structure of permanent way –different types of rails, requirements of a good rail, Sleepers- functions, Types of sleepers, characteristics of a good sleeper –spacing of sleepers-sleeper density.

Unit-VIII : WATER SUPPLY AND SANITARY ENGINEERING

Quality of water, Need for protected water supply, Total quantity of water for a town, per capita demand and factors affecting demand, Forecasting population by arithmetical, geometrical and incremental increase methods, Sources and conveyance of water: surface sources, underground sources, Types of Intakes. Quality and Methods of purification of water.

Distribution System: Methods of supply, Storage-Distribution systems, Types of layout- dead end, grid, radial and ring system their merits and demerits and their suitability. General layout of water supply arrangements in buildings.

System of sewage disposal-types of sewerage systems, Different shapes of cross-section for sewers, Strength of sewage, sampling of sewage, characteristics of sewage - principles of treatment, Preliminary treatment, secondary treatment. Sewers –sewer appurtences-shapes, merits and demerits.

Unit-IX: BUILDING MATERIALS AND CONSTRUCTION PRACTICE

Stones-classification of rocks. Bricks – manufacturing, tests on bricks. Tiles- types of tiles. Cement- classification manufacturing-tests. Mortars – classification - proportioning. Concrete-proportioning – water-cement ratio – workability – admixtures-curing methods-R.M.C. Timber and surface protective materials. Characteristics-types and uses.

Classification of buildings, foundations-N.B.C. classification-bearing capacity of soil- types of foundations. Masonry-Bonds in brick masonry. Plastering-purpose. Pointing purpose and types.
