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Section 1: Strength of Materials

Systems of forces; Composition and resolution of forces; friction; Centroids and moment of inertia; Mechanical properties of engineering materials - elastic constants; Different types of stresses and strains; Shear force and bending moments in beams; flexural and shear stresses in beams; combined bending; torsion

Section 2: Structural Analysis

Slope and deflection of determinate beams by double integration, Macaulay's method, conjugate beam method, moment area method and unit load method; Analysis of propped cantilevers and fixed beams by Area - Moment method and draw SFD, BMD; Analysis of statically determinate portal frames and plotting of SFD & BMD; Analysis of Continuous beams by Clapeyron's theorem of three moments; Three hinged arch and stiffening girder; Analysis of continuous beams and portal frames by Moment Distribution Method, Slope Deflection Method, flexibility and stiffness method; Two hinged arches.

Section 3: Design of Concrete and Steel Structures

Basics of Working Stress and Limit State Method. Analysis and design of RCC elements like singly / doubly reinforced rectangular beams - singly reinforced T-beams (Cantilevers, Simply supported/ Continuous beams, Lintels, etc.) for shear and flexure; Design of One-way/Two-way slabs and Staircases; Design of axially loaded Columns and Footings.

Section 4: Design of Steel Structures

Analysis and design of tension members, compression members, including columns and beams; Welded connections; column bases; plate girder; framed and seated connections.

Section 5: Construction Materials and Construction Practice

Different construction materials and their properties, different types of cement, grades of cements, tests on cement and other construction materials; Types of modern building materials such as ceramic

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products, glass, metals and plastics; Preparation of mortar and cement concrete; Different types of concretes; Types of foundations; Classification of stone masonry and brick masonry; Types of doors, windows, lintels and stairs; Different methods of pointing, plastering and termite proofing; Scaffolding, shoring, underpinning and form work; Procedure of colour washing, white washing, painting, varnishing.

Section 6: Soil Mechanics and Foundation Engineering

Development of Soil Mechanics; Soil formation; three Phase System; Index and Engineering properties; Compaction and consolidation; Permeability, Darcy's law; Shear strength of soil, Mohr's stress circle, Mohr-Coulomb failure theory, Shear strength test, Unconfined compression test; Optimum moisture content, Proctor's Compaction test; Soil exploration: Direct, Semi-direct and Indirect methods, Spacing and depth of test borings, Sub-Soil Sampling, Disturbed and Undisturbed samples, Seepage analysis: Head, Gradient and Potential; Hydraulic gradient, Seepage pressure; Methods of determining bearing capacity, Types of failures in soil, Rankine's analysis, Terzaghi's analysis, Effect of water table, Settlement of foundation; Plate load test; Earth pressure

Section 7: Surveying

Different types of Surveying (Chain, Compass, Plain Table, Theodolite); Traverse; Leveling; Contouring; Minor instruments; Total Station, Modern Surveying.

Section 8: Transportation Engineering

Development of Roads in India; Modes of transportation; Classification of roads as per different criterion; Different road development plans; Highway alignment and location surveys; Geometric Design; Traffic Engineering (Traffic surveys, Parking; intersections/ junctions, Traffic control devices); Highway Materials and their evaluation; Types of Pavements: Flexible and Rigid; Design of pavements; Highway Construction, rehabilitation and maintenance; Stabilized soil. Elements of railway engineering, airport engineering, and water transportation.

Section 9: Estimating and Costing

Different types of estimates; Taking out of the quantities; Preparation of estimates; Contract and Accounts; PWD Method

Section 10: Water Resources Engineering

Pressure of liquid at a point: Static pressure, Atmospheric pressure, Gauge pressure, Vacuum pressure, and Absolute pressure; Measurement of pressure: Simple mercury barometer, Pressure measuring devices and problems, Piezometer tube, Simple U-tube manometer, Differential manometer, Micrometer; Hydrostatic pressure: Pressure on plane surfaces, horizontal, vertical, and inclined Surfaces; Total Pressure: centre of pressure and depth of centre of pressure. Flow through pipes: various types of flows including laminar, transition, and turbulent flow; steady and unsteady flow, uniform and non-uniform flow; Bernoulli's theorem, Venturimeter; Open channel flow: Rectangular and Trapezoidal channels, most economical section, discharge, Chezy's formula, Bazin's formula, and Manning's formula; methods of measurement of velocity. Methods of Irrigation; Advantages and disadvantages of irrigation; water requirements of crops, factors affecting water requirement; consumptive use of water, water depth or delta and crop relation, Duty of water, relation between delta, duty and base period, Soil crop relationship and soil fertility, sprinkler Irrigation; Drip irrigation – advantages & limitations, suitability; Earthen and gravity dam and appurtenances; Canal Irrigation: classifications of canals, canal alignment, Inundation canals, Bandhara irrigation, advantages and disadvantages; Silt theories – Kennedy's theory, Lacey's

theory, Drawbacks in Kennedy's & Lacey's theories, comparison of Lacey's and Kennedy's theories; Design of unlined canals based on Kennedy and Lacey's theories, suspended and bed loads. Introduction to elements of hydrology.

Section 11: Environmental Engineering

Water supply: Public water supply system and demand, types of demand, per capita demand, and prediction of population. Intakes: types of intakes, description of intakes, infiltration galleries and infiltration wells in river beds, necessity of pumps, types of pumps, pipes for conveyance of water. Water treatment: sedimentation, types of sedimentation, coagulation, coagulants and their selection, types of sedimentation tanks, filtration, and RO process. Distribution system: gravity, pumping, and combined systems. Sanitary Engineering: estimation of storm water, minimum size and shape of sewer, materials used for sewer, joints, laying and testing, manhole, lamp hole, catch basin, street inlet, grease and oil trap, flushing tanks, drainage arrangements in buildings, sanitary fittings; sewage pumps; Sewage treatment: primary and secondary treatments, screens, skimming tanks, grit chambers, sedimentation tanks; Filters: types and description of filters; activated sludge process, septic tanks, construction and working of septic tanks. Methods of solid waste disposal: incineration, dumping, sanitary landfill, composting, and energy from waste.