

Indicative Syllabus

Name of Post	Junior Engineer (Civil)
Minimum Educational Qualification	Regular Diploma in Civil Engineering from AICTE/ UGC approved University / Institute.

- 1. Building Materials:** Physical and Chemical properties, Classification, Standard Tests, Uses and manufacture/quarrying of materials, e.g., building stones, silicate based materials, Cement (Portland), Asbestos products, Timber and Wood based Products, Laminates, bituminous materials, Paints, Varnishes.
- 2. Estimating, Costing, and Valuation:** Estimate, Glossary of technical terms, Analysis of rates, Methods, and unit of measurement, Items of work — Earthwork, Brickwork (Modular & Traditional bricks), RCC work, Shuttering, Timber work, Painting, Flooring, Plastering; Boundary wall, Brick building, Water Tank, Septic tank, Bar bending schedule. Centre line method, Mid-section formula, Trapezoidal formula, Simpson's rule; Cost estimate of Septic tank, flexible pavements, Tube well, isolated 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. Surveying:** Principles of surveying, measurement of distance, chain surveying, working of prismatic compass, compass traversing, bearings, local attraction, plane table surveying, theodolite traversing, adjustment of theodolite, Levelling, Definition of terms used in levelling, contouring, curvature and refraction corrections, temporary and permanent adjustments of dumpy level, methods of contouring, uses of contour map, tachometer survey, curve setting, earthwork calculation, advanced surveying equipment.
- 4. Soil Mechanics:** 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, Soil classification, plasticity chart, Permeability of soil, coefficient of permeability, determination of the coefficient of permeability, Unconfined and confined aquifers, effective stress, quicksand, consolidation of soils, Principles of consolidation, the 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.
- 5. Hydraulics:** Fluid properties, hydrostatics, measurements of flow, Bernoulli's theorem and its application, turbines, flow through pipes, flow in open channels, weirs, flumes, spillways, pumps and turbines.
- 6. Irrigation Engineering:** Definition, Necessity, Benefits, effects of irrigation, 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, Irrigation efficiencies; Different type of canals, types of canal irrigation, loss of water in canals. Canal lining — types and advantages; Shallow and deep to wells, yield from a well, Weir and barrage, Failure of a weir and permeable foundation, Slit and Scour, Kennedy's theory of critical velocity. Lacey's theory of uniform flow; Definition of flood, causes, and effects,

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methods of flood control, water logging, preventive measures; Land reclamation, Characteristics affecting the fertility of soils, purposes, methods, description of land and reclamation processes, Major irrigation projects in India.

7. **Transportation Engineering:** Highway Engineering – cross sectional elements, geometric design, types of pavements, pavement materials – aggregates and bitumen, different tests, Design of flexible and rigid pavements – Water Bound Macadam (WBM) and Wet Mix Macadam (WMM), Gravel Road, Bituminous construction, Rigid pavement joint, pavement maintenance, Highway drainage; Railway Engineering - Components of permanent way – sleepers, ballast, fixtures and fastening, track geometry, points and crossings, track junction, stations and yards.
8. **Environmental Engineering:** Quality of water, source of water supply, purification of water, distribution of water, need of sanitation, sewerage systems, circular sewer, oval sewer, sewer appurtenances, sewage treatments Surface water drainage; Solid waste management – types, effects, engineered management system Air pollution – pollutants, causes, effects, control Noise pollution – cause, health effects, control.
9. **Structural Engineering:** Theory of structures: Elasticity constants, types of beams – determinate and indeterminate, bending moment and shear force diagrams of simply supported, cantilever and over hanging 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
10. **Concrete Technology:** Properties, Advantages and uses of concrete, cement aggregates, importance of water quality, water cement ratio, workability, mix design, 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
11. **RCC Design:** RCC beams-flexural strength, shear strength, bond strength, design of singly reinforced and double reinforced beams, cantilever beams T-beams, lintels, one way and two way slabs, isolated footings Reinforced brick works, columns, staircases, retaining wall, water tanks.
12. **Steel Design:** Steel design and construction of steel columns, beams, roof trusses, plate girders.