SYLLABUS- JUNIOR ENGINEER (CIVIL)

- **Building Materials:**

Physical and Chemical properties, classification, standard tests, uses and manufacture/quarrying of materials e.g. building stones, silicate based materials, cement (Portland), timber and wood based products, laminates, bituminous materials, paints, varnishes.

- **Estimating, Costing and Valuation:**

Estimate, glossary of technical terms, analysis of rates, methods and unit of measurement, Items of work – earthwork, Brick work (Modular & Traditional bricks), RCC work, Shuttering, Timber work, Painting, Flooring, and Plastering. Boundary wall, Brick building, Water Tank, Septic tank, Bar bending schedule, Centre line method, Mid-section formula, Trapezodial formula, Simpson's rule. Cost estimate of Septic tank, flexible pavements, Tube well, isolated and combined footings, Steel Truss, Valuation – Value and cost, scrap value, salvage value, assessed value, sinking fund, depreciation and obsolescence, methods of valuation.

- **Surveying:**

Principles of surveying, measurement of distance, chain surveying, working of prismatic compass and 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, tachometric survey, curve setting, earth work calculation, advanced surveying equipment.

- **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, ISI soil classification and plasticity chart. Permeability of soil, coefficient of permability, determination of coefficient of permeability, Unconfined and confined aquifers, effective stress, quick sand, consolidation of soils, Principles of consolidation, Calculation of Shear strength of soils, direct shear test, Vane shear test, Triaxial test. Soil compaction, Laboratory compaction test, Maximum dry density and optimum moisture content, Bearing capacity of soils, plate load test, standard penetration test.

- **Hydraulics :**

Fluid properties, hydrostatics, measurements of flow, Bernoulli's theorem and its application, flow through pipes, flow in open channels, weirs, flumes, spillways, pumps and turbines.

- **Irrigation Engineering:**

Hydrology – Measurement of rainfall, run off coefficient, rain gauge, losses from precipitation – evaporation, infiltration, etc. 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. Definition of flood, causes and effects, methods of flood control, water logging, preventive measure.

- **Transportation Engineering:**

Highway Engineering – cross sectional elements, 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, Traffic Engineering – intersections and interchanges, traffic signs and markings, road safety.

- **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

- **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, retaining walls, eccentric loads, slope deflection of simply supported and cantilever beams, critical load and columns, Torsion of circular section.

- **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.

- **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 (RCC design questions may be based on both Limit State and Working Stress methods).

- **Steel Design:**

Steel design and construction of steel columns, beams roof trusses and plate girders

- **Construction Management.**

Construction Planning, CPM, PERT, inspection and quality control, Payment of Wages Act 1936,Minimum Wages Act 1948 (as amended)

- **General English, Quantitative Aptitude, Analytical Reasoning, General Knowledge / Current Affairs**.