Tata Institute of Fundamental Research

Hyderabad

Syllabus for the post of Project Junior Engineer (Civil), Post. Sr. No.06, Advt. No. 2025/02

1. Building Materials

- Physical & Mechanical Properties of Construction Materials
- Stones: Classification, Quarrying, Dressing, Testing
- Bricks: Manufacturing, Types, Tests, Defects
- Cement: Composition, Types (OPC, PPC, PSC), Setting, Testing
- Lime: Classification, Uses
- Timber: Defects, Seasoning, Preservation
- Concrete: Ingredients, Mix Design, Workability, Curing, Tests
- Bitumen, Asphalt, Paints, Varnishes, Distempers – Properties and Uses

2. Estimating, Costing & Valuation

- Units of Measurement (IS 1200)
- Methods of Estimation: Long Wall–Short Wall, Centre Line
- Rate Analysis for Earthwork, Brickwork, Concrete, Plastering, Flooring, Painting
- Bar Bending Schedule for RCC Works
- Earthwork Calculation using Trapezoidal & Simpson's Rule
- Valuation: Purpose, Types, Depreciation, Salvage Value

3. Surveying

- Principles of Surveying
- Chain Survey: Errors & Corrections
- Compass Survey: Bearings, Local Attraction
- Levelling: Types, Methods, RL Computations, Contouring
- Theodolite Survey: Traversing, Balancing, Computations
- Tachometry: Stadia Formulae, Applications
- Plane Table Survey: Methods, Errors
- Curves: Simple, Compound, Transition Curve Setting

4. Soil Mechanics

- Soil Classification: Index Properties, IS Classification
- Permeability & Darcy's Law
- Compaction: Proctor Test, OMC, Dry Density
- Consolidation: Terzaghi's Theory
- Shear Strength: Mohr–Coulomb Theory, Direct Shear, Triaxial Test
- Bearing Capacity: Terzaghi & IS Code Formulae
- Earth Pressure Theories: Rankine & Coulomb

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5. Hydraulics & Fluid Mechanics

- Fluid Properties: Viscosity, Compressibility
- Pressure Measurement: Manometers, Pascal's Law
- Fluid Statics: Hydrostatic Forces on Surfaces, Buoyancy
- Fluid Dynamics: Bernoulli's Theorem, Applications
- Flow through Pipes: Laminar, Turbulent Flow, Darcy-Weisbach Equation
- Hydraulic Machines: Pumps, Turbines – Types, Efficiencies
- Flow Measurement: Venturimeter, Orifices, Notches, Weirs

6. Transportation Engineering

- Highway Engineering: Classification, Road Geometrics
- Highway Materials: Tests on Aggregates, Bitumen
- Pavement Design: Flexible & Rigid Pavements (IRC Guidelines)
- Construction of WBM, Bituminous & Concrete Roads
- Traffic Engineering: Traffic Volume, Speed, Parking & Signals

7. Environmental Engineering

- Water Supply: Sources, Treatment Processes (Sedimentation, Filtration, Disinfection)
- Distribution Systems: Layout, Design of Pipes
- Wastewater: Characteristics, Primary/Secondary Treatment
- Sewerage Systems: Types, Laying, Testing
- Solid Waste Management: Collection, Disposal
- Air & Noise Pollution: Causes, Control Measures

8. Structural Engineering

- Theory of Structures: Bending Moment & Shear Force Diagrams, Stresses & Strains, Mohr's Circle, Deflection of Beams, Columns & Struts
- RCC Design: Working Stress & Limit State Methods, Design of Beams, Slabs, Columns & Footings (IS 456:2000)
- Steel Design: Tension Members, Compression Members, Beams & Connections (IS 800)

9. General Civil Engineering

- Knowledge of Auto-Cad.
- Repair, Maintenance & Rehabilitation of structures.
- Knowledge of IS code & NBC
- Green Building concept

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