

To measure candidate's reasoning ability, quantitative aptitude and proficiency in English and General Awareness

- a) Test of Reasoning
- b) Test of Quantitative Aptitude
- c) Test of General Awareness and
- d) Test of English Language

➤ **Junior Engineer (Civil)**

Civil Engineering

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.

Surveying: Principles of surveying, working of properties, compass and bearing, plane table surveying, theodolite traverse, adjustment of theodolite, levelling and contouring, curvature, refraction, permanent adjustment of dumpy level, methods of contouring and uses of a control map, tachometric survey.

Soil Mechanics: Origin of soil phase diagram, definitions of void ratio, porosity, degree of saturation, water content, specific gravity of soil grains and unit weights, grain size distribution curves for different soil and their uses. Atterberg's limits, ISI soil classification, plasticity chart, coefficient of permeability, effective stress, consolidation of soils. Calculation of shear strength of soils, direct shear test, vane shear test, triaxial test, soil compaction, Lab compaction, Lab compaction test, moisture content and 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.

Environmental Engineering: Quality of water, source of water supply, purification of water, distribution of water, need of sanitation, sewerage system, circular sewers, oval sewer, sewer appurtenances, surface water drainage, sewage treatments.

Structural Engineering: Theory of structures: Elasticity constants, type 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 rect. & circular section, 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.

Concrete Technology : Properties, Advantages and uses of concrete, cement aggregates 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 structure.

RCC Design:

RCC beams: flexural strength, shear strength, bond strength, design of single reinforced beams, lintels, cantilever beams, double reinforced beams, one way slabs, two way slabs, isolated footings, reinforced brick work. T-beams, columns, staircases, retaining walls, water tanks (RCC design questions may be based on both Limit State method and Working Stress method).

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

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➤ **Junior Engineer (Electrical/Mechanical)**

General Engineering (Electrical and Mechanical)

• **Electrical Engineering**

Basic Electrical Engg.: Elect. Measurements, Concepts of current, voltage, resistance, power and energy, their units, Ohm's law.

Circuit Law: Kirchoff's law, solution of simple network problems, Network theorems and their applications, Electro-magnetism, concept of flux, $e m f$, reluctance, magnetic circuits. Electro-magnetic induction, self and mutual inductance. A.C. fundamentals, instantaneous, peak, R.M.S. and average values of alternating waves, Equation of sinusoidal wave form, simple series and parallel AC. circuits consisting of R.L. and C, Resonance. Measurement and measuring instruments, Moving coil and moving iron ammeters and voltmeters, Extension of range, Wattmeters, Multimeters, megger, Basic Electronics.

Electrical machines: Basic principles of D.C. motors, generators, their characteristics, Speed control and starting of D.C. motors, losses and efficiency of D.C. machines. 1-Phase and 3-phase transformers: Principles of operation, equivalent circuit, voltage regulation, O.C. and S.C. tests, efficiency, auto transformers. Synchronous machines, generation of 3-phase $e m f$, armature reaction, Voltage regulation, parallel operation of two alternators, synchronizing, starting and applications of synchronous motors. 3-Phase Induction motor, rotating magnetic field, principle of operation, equivalent circuit, torque-speed characteristics, starting and speed control of 3-phase induction motors, Fractional KW motors, 1-phase induction motors, A.C. series motor, reluctance motor.

General, Transmission and Distribution: Different types of power stations, Load factor, diversity factor, demand factor, simple problems thereon, cost of generation, inter-connection of power stations. Power factor improvement, various types of tariffs, types of faults, short circuit current for symmetrical faults. Switchgears- rating of circuit breakers: Principles of a extinction by oil and air, H.R.C. fuses, Protection, earth leakage, over current, Buchhotgz relay, Merz- Prince system of protection of generators & transformers, protection of feeders and bus bars. Lightning arresters, Various transmission and distribution systems, Comparison of conductor materials, efficiency for different systems. Utilization of Electrical Energy, Illumination, electric heating, Electric welding, electroplating, electric drives and motors.

- **Mechanical Engineering**

Flow of Fluids: Laminar & turbulent flow, equation of continuity, Bernoulli's theorem, measurement of discharge, flow through pipes, friction losses, Forces of jet impinging on vanes, blades, work done and efficiency, classification of turbines & pumps.

Thermal Engineering:

Laws of thermodynamics, change in entropy in various processes; uses of steam, Properties of steam table & charts; Construction & Working of Cochran, Lancashire locomotive & Babcock & Wilcox boilers, working of steam turbine, Otto & Diesel Cycles, working of IC engines, Carburetion, Solex Carburettor. Diesel fuel, pump & injector: Cooling & lubrication.

Production Engineering: Foundry- Different casting processes, concept of Patterns; types of mould making, puring defect in castings, causes & remedies, Welding-classification and types of welding, Testing and defects in welds. Lathes- working of lathe, various tools, operation on lathes, types of lathes. Drilling operations performed on drilling machines. Description, principles of working and various operations on machine tools, milling machine, shaper, grinder, boring and slotting machines.

Strength of Materials: Stresses in composite bars, relation between elastic constants, Resilience under different types of loads, SF and BM diagrams; stresses in beams-combined direct and bending stresses, Struts and columns – Euler's and Rankin's theories, Torsion of circular shafts.

Theory of Machines: Simple Machines – Four bar chain, Slider crank chain, double slider crank chain, Flywheel – Turning moment diagrams. Fluctuation of energy, Friction-in collar and pivots, plate clutch, conical clutch, journal bearing. Transmission of power through flat and V-belts, Gears, profile of gears, Governors- Watt and Hartnell governors

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➤ **Junior Hindi Translator**

Stage-I: a) General Hindi : 100 marks (Objective type) b) General English : 100 marks (Objective type) The questions will be designed to test the candidates' understanding of the languages and literature, correct use of words, phrases and idioms and ability to write the languages correctly, precisely and effectively. The questions will be of degree level.

Stage-II: Translation and Essay: 200 Marks (Conventional Type) The paper will contain two passages for translation-one passage for translation from Hindi to English and one passage for translation from English to Hindi, and an Essay each in Hindi and English, to test the candidates' translation skills and their ability to write as well as comprehend the two languages correctly, precisely and effectively. The level of the paper will be consistent with the educational qualifications prescribed