

**SYLLABUS FOR THE RECRUITMENT TEST TO THE POST OF
JUNIOR ENGINEERS (ELECTRICAL/MECHANICAL)**

Total	- 300 Marks	Duration - 3 Hours
General Studies	- 60 Marks	
Technical Paper	- 180 Marks	
Personal Interview	- 60 Marks (for short listed candidates only).	

General Studies :(60 Marks) - General English, General Knowledge, Aptitude.

Technical Papers. (180 Marks)

1. ELECTRICAL ENGINEERING

Basic concepts. Concepts of resistance, inductance, capacitance, and various factors affecting them. Concepts of current, voltage, power, energy and their units.

Circuit law :Kirchhoff's law, Simple Circuit solution using network theorems.

Magnetic Circuit: Concepts of flux, mmf, reluctance, Different kinds of magnetic materials, Magnetic calculations for conductors of different configuration e.g. straight, circular, solenoidal, etc. Electromagnetic induction, self and mutual induction.

AC Fundamentals : Instantaneous, peak, R.M.S. and average values of alternating waves, Representation of sinusoidal wave form, simple series and parallel AC Circuits consisting of R.L. and C, Resonance, Tank Circuit. Poly Phase system - star and delta connection, 3 phase power, DC and sinusoidal response of R-Land R-C circuit.

Measurement and measuring instruments : Measurement of power (1 phase and 3 phase, both active and re-active) and energy, 2 wattmeter method of 3 phase power measurement. Measurement of frequency and phase angle. Ammeter and voltmeter (both moving oil and moving iron type), extension of range wattmeter, Multimeters, Megger, Energy meter AC Bridges. Use of CRO, Signal Generator, CT, PT and their uses. Earth Fault detection.

2. ELECTRICAL MACHINES :

DC Machines - Construction, Basic Principles of DC motors and generators, their characteristics, speed control and starting of DC Motors, Method of braking motor, Losses

and efficiency of D.C. Machines.

1 phase and 3 phase transformers - Construction, Principles of operation, equivalent circuit, voltage regulation, O.C. and S.C. Tests, Losses and efficiency, Effect of voltage, frequency and wave form on losses, Parallel operation of 1 phase & 3 phase transformers, Auto-transformers.

3 phase induction motors - rotating magnetic field, principle of operation, equivalent circuit, torque-speed characteristics, starting and speed control of 3 phase induction motors, Methods of braking, effect of voltage and frequency variation on torque speed characteristics.

Fractional Kilowatt Motors and Single Phase Induction Motors: Characteristics and applications.

Synchronous Machines - Generation of 3-phase e.m.f. armature reaction, voltage regulation, parallel operation of two alternators, synchronizing, control of active and reactive power, Starting and applications of synchronous motors.

3. GENERATION, TRANSMISSION AND DISTRIBUTION

Power Stations - Different types of power stations, Load factor, diversity factor, demand factor, 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 arc extinction by oil and air, H.R.C. Fuses, Protection against earth leakage / over current, etc. Buchholtz relay, Merz-Price system of protection of generators & transformers, protection of feeders and busbars, Lightning arresters, various transmission and distribution system, comparison of conductor materials, efficiency of different system.

Cable - Different type of cables, cable rating and de-rating factor.

4. ESTIMATION AND COSTING

Estimation of lighting scheme, electric installation of machines and relevant IE rules, earthing practices and IE Rules.

5. UTILIZATION OF ELECTRICAL ENERGY :

Illumination, Electric heating, Electric welding, Electroplating, Electric drives and motors.

6. BASIC ELECTRONICS :

Working of various electronic devices e.g. P N Junction diodes, Transistors (NPN and PNP type), BJT and JFET. Simple circuits using these devices.

7. FUNDAMENTAL OF COMPUTER AND APPLICATION :

Basic concept, bus architecture, operating system, Basic computer system, memory organization, input/output device, storage device. MS application

8. Concept of GIS substations and substation automation systems (SAS)