Scheme of Assessment (Examination) and Syllabus for the Post of Junior Engineer (Electrical)

1. The Assessment will have two component i.e. Part-I (Objective Type Test) and Part-II (Practical & Viva Voc). Details of these two components are as follows :

Components	Mode of Examination	Subject	No. of Questions/ Maximum Marks	Duration
Part-I Objective Type Test	Offline	(i) Basic Questions on General Science (such as Physics, Chemistry, Biology, Mathematics and Environment)	30/30	2.00 hours
		(ii) General Engineering (Electrical)	30/30	
			60/60	
Part-II (Practical & Viva Voc)	–	Electrical and Maintenance Work	40 marks	1.00 hour
		Total	100/100	
Minimum qualifying marks – a. For General & EWS candidates – 45% b. For OBC candidates – 40% b. For SC/ST/PwD candidates – 35%				

2. The Part-I will consist of Objective Type, Multiple choice questions only. The questions will be set both in English & Hindi.
3. There shall be negative marking for wrong answers in Part-I to the tune of 1/4th of marks allotted per question.
4. Marks awarded by the examiners while assessing the candidates is final. No request for its re-assessment will be entertained under any circumstances.
5. Candidates will be selected on the basis of their performance in Part-I and Part-II put together.
6. Final merit shall be drawn on the basis of combined scores of Part-I and Part-II.
7. The standard of the questions/test will be approximately of the level of Diploma in Engineering (Electrical).

8. The details of the syllabus are given below:-

PART–I

Basic Questions on General Science (such as Physics, Chemistry, Biology, Mathematics and Environment)

General Engineering (Electrical)

Basic concepts, Circuit law, Magnetic Circuit, AC Fundamentals, Measurement and Measuring instruments, Electrical Machines, Fractional Kilowatt Motors and single phase induction Motors, Synchronous machines, generation, transmission and distribution, estimation and costing, utilization and electrical energy, basic electronics.

PART–II

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, RMS and average values of alternating waves, Representation of sinusoidal wave form, simple series and parallel AC Circuits consisting of RL 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.

Electrical Machines: (a) DC Machine – 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 DC Machines (b) 1 phase and 3 phase transformers – Construction, Principles of operation, equivalent circuit, voltage regulation, OC and SC Tests, Losses and efficiency Effect of voltage, frequency and wave form on losses Parallel operation of 1 phase /3 phase transformers Auto transformers (c) 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 emf armature reaction, voltage regulation, parallel operation of two alternators, synchronizing, control of active and reactive power starting and 18 applications of synchronous motors.

Generation, Transmission and Distribution – 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, HRC Fuses, Protection against earth leakage/over current, etc Buchholtz relay, Merz-Price system of protection of generators & transformers, protection of feeders and bus bars Lightning arresters, various transmission and distribution system, comparison of conductor materials, efficiency of different system Cable – Different type of cables, cable rating and derating factor.

Estimation and Costing : Estimation of lighting scheme, electric installation of machines and relevant IE rules Earthing practices and IE Rules.

Utilization of Electrical Energy : Illumination, Electric heating, Electric welding, Electroplating, Electric drives and motors.

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