Assistant Executive Engineer ELECTRICAL

QUALIFICATION; BE / BTech

1. Electric Circuits: Active and passive network elements – dependent and independent\ sources – response of passive elements to arbitrary excitations – energy stored in inductance and capacitance – Kirchoff's loss – formation of mesh and Nodel Integro differential equations – their solutions by classical and Laplace transformation methods – Transient and steady state response of RL, RC elements to impulse, step, ramp and sinusoidal inputs – single phase AC circuits – methods of solutions – poly phase circuits – analysis of balanced and unbalanced circuits – measurements of three phase power.

2. Electrical Measurements and Instruments: Absolute and secondary instrument types Principle of operation of different type of instrument – extension of instrument ranges measurement of voltage, current, power and energy – localization of cable faults – Murray loop and Varley loop tests – Cathode ray Oscilloscope.

3. Illumination: Solid angle, luminous flux, luminous intensity – Illumination and candle power laws of Illumination – flood lighting, street lighting – electric lamps.

4. DC Generators and Motors: Types of DC generators – EMF equation – constructional details – characteristics of shunt, series and compound generators – Armature reaction – types of DC motors – Torque developed in a DC motor – speed controls of DC motors and starters.

5. Transformers: Constructional details – Principle of operati9on – vector diagrams on no load and load – regulation and efficiency – equivalent circuits and tests for the determination of parameters of equivalent circuits – types of three phase transformers and their applications – Scott connection of transformers.

6. 3-Phase Induction Motors: Principle of operation – Cage and Slip ring motors – torque slip characteristics – methods of speed control.

7. 3-Phase Alternators: Principle of operation and constructional details – types of Alternators – synchronous impedance – voltage regulation – short circuit ratio and its importance Phasor diagrams of round rotor and salient pole machines – synchronization– behaviour of an alternator connected to infinite bus – effect of varying excitation current and mechanical torque – power angle curves – control of active and reactive powers.

8. 3-Phase Synchronous Motors: Principle of operation – torque developed and methods of starting – V and Inverted V curves – effects of variations of excitation – synchronous condensers.

9. Single phase induction Motors: Types of single phase motors – Types of Single phase induction motors – characteristics and methods of starting – shaded pole induction motor.

10. Transmission & Distribution: Line constants – Inductance and Capacitance calculations – Representation of over head Lines – Short, Medium and Long lines – ABCD constants – Mechanical Design – Sag, Tension Calculations, Tuned Power Lines.

11. Over Head Line Insulators: Types of Insulators – Potential distributions over a string of suspension insulators – string efficiency – Methods of improving string efficiency.

12. Underground Cables: Insulation of cables – Grading of cables – Capacitance Measurement in cables – Testing of Cables – Power frequency withstand tests.

13. Fault Calculations: Balanced Fault calculations on systems – Symmetrical components Types of faults – Analysis of unbalanced faults.

14. Generating Stations: Location and types, types of hydroelectric power stations, layout of a hydro-power plant, types of turbines used – Pumped storage installations – Layout of thermal electric power stations, types of turbines used, condensers, cooling towers, boiler feed pump; energy flow diagram of steam power plant. Nuclear power generation; nuclear fission – types of nuclear power reactors – Principle of a fast breeder reactor.

15. Protection: Characteristic of Relays – Over current, directional and distance protection of lines. Protection of Alternators against stator faults, rotor faults, loss of excitation, unbalanced loading, overloading, failure of prime-mover. Over speeding and over voltage. Protection of transformers against winding faults, overloads and external short circuits.

16. Circuit Breakers: Air-blast, oil, minimum oil, vacuum – sulphur hexafluoride and d.c. circuit breakers – Relative merits and demerits.

17. Economic Aspects: Generation costs and their classification, load curve, load utilization and plant capacity factors. Load sharing between base load and peak-load stations. Load forecasting. Economical distribution of load between unit within a plant and between plants. Modeling of fuel costs for thermal generation. Optimal operation of an all thermal generating system and of a hydro-thermal system. Consideration of transmission losses.

18. Utilization of Electrical Energy: Industrial drives – Motors for various drives – Estimating and Rating – Testing of D.C. and A.C. motors – Neutral Earthing.