

Indicative Syllabus

Post Code	001
Name of Post	Assistant Engineer/ Manager (Technical/ Distribution/ Transmission) (Electrical) – Trainee
Minimum Educational Qualification	Regular B.E./ B.Tech. or AMIE Degree in Electrical/ Electrical & Electronics Engineering from AICTE/UGC approved University/ Institute.

- 1. Electric Circuits:** Network Elements: Ideal voltage and current sources, R, L, C, M elements; Network graph, KCL, KVL, Node and Mesh analysis, Transient response of dc and ac networks, Sinusoidal steady- state analysis, Resonance, Passive filters, Ideal current and Voltage sources. Thevenin's Theorem, Norton's Theorem, Superposition Theorem, Maximum Power Transfer theorem, Two- port networks, Three phase circuits, star-delta transformation, complex Power and power factor in ac circuits.
- 2. Electromagnetic Fields:** Coulomb's Law, Electric Field Intensity, Electric Flux Density, Gauss's Law, Divergence, Electric field and potential due to point, line, plane and spherical charge distributions, Effect of dielectric medium, Capacitance of simple configurations, Biot-Savart's law, Amper's law, Curl, Farady's laws, Lorentz force, Inductance, Magneto motive force, Reluctance, Magnetic circuits, Self and Mutual inductance of simple configurations.
- 3. Signals and systems:** Representation of continuous and discrete- time signals, Shifting and scaling operations, Linear Time Invariant and Causal systems, Fourier series representation of continuous and discrete time periodic signals, Sampling theorem, Applications of Fourier Transform, Laplace Transform and z-Transform. R.M.S. value, average value calculation for any general periodic waveform.
- 4. Electrical Machines:** Single phase transformer: equivalent circuit, phasor diagram, open circuit and short circuit tests, regulation and efficiency; Three phase transformers: connections, vector groups, parallel operation; Auto- transformer, Electromechanical energy conversion principles, DC machines: separately excited, series and shunt, motoring and generating mode of operation and their characteristics, starting and speed control of dc motors; Three phase induction motors: principle of operation, types, performance, torque-speed characteristics, no-load and blocked rotor tests, equivalent circuit, starting and speed control; Operating principle of single phase induction motors; Synchronous machines: cylindrical and salient pole machines, performance, regulation and parallel operation of generators, starting of synchronous motors, characteristics; Types of losses and efficiency calculations of electric machines.
- 5. Power Systems:** Basic concepts of electrical power generation, AC and DC transmission concepts, Models and performance of transmission lines and cables, Economic Load Dispatch (with and without considering transmission losses), Series and shunt compensation, Electric field distribution and insulators, Distribution systems, Per- unit quantities, Bus admittance matrix, Gauss-Seidel and Newton-Raphson load flow methods, Voltage and Frequency control, Power factor correction, Symmetrical components, Symmetrical and unsymmetrical

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fault analysis, Principles of over- current, differential and distance protection; Circuit breakers, System stability concepts, Equal area criterion.

- 6. Control Systems:** Mathematical modelling and representation of systems, Feedback principle, transfer function, Block diagrams and Signal flow graphs, Transient and Steady- state analysis of linear time invariant systems, Routh-Hurwitz and Nyquist criteria, Bode plots, Root loci, Stability analysis, Lag, Lead and Lead- Lag compensators; P, PI and PID controllers; State space model, Solution of state equations of LTI systems, State transition matrix.
- 7. Electrical and Electronic Measurements:** Bridges and Potentiometers, Measurement of voltage, current, power, energy and power factor; Instrument transformers, Digital voltmeters and multi meters, Phase, Time and Frequency measurement; Oscilloscopes, Error analysis.
- 8. Analog and Digital Electronics:** Characteristics of diodes, BJT, MOSFET; Simple diode circuits: clipping, clamping, rectifiers; Amplifiers: Biasing, Equivalent circuit and Frequency response; Oscillators and Feedback amplifiers; Operational amplifiers: Characteristics and applications; Single Stage Active filters, Active Filters: Sallen Key, Butterworth, VCOs and Timers, Combinational and Sequential logic circuits, Multiplexer, De-multiplexer, Schmitt triggers, Sample and hold circuits, A/D and D/A converters, 8085 Microprocessor: Architecture, Programming and Interfacing.
- 9. Power Electronics:** Characteristics of semiconductor power devices: Diode, Thyristors, Triac, GTO, MOSFET, IGBT; DC to DC conversion: Buck, Boost and Buck-Boost converters; Single and three phase configuration of uncontrolled rectifiers, Voltage and Current commutated thyristor based converters, Bidirectional ac to dc voltage source converters, Issues of line current harmonics for uncontrolled thyristor based converters; Power factor, Distortion factor of ac to dc converters, Single phase and three phase inverters, Sinusoidal pulse width modulation