

Ph D Entrance Examination Syllabus: Electrical Engineering

Note:1 Entrance Test will be of 100 marks of 100 questions and a candidate must secure 50% marks to qualify the same. In case of SC/ST / Differently-abled candidates of Haryana State, a relaxation of 5% of 50 i.e. 2.5% will be allowed.

2. Entrance test syllabus shall consist of 50% of Research Methodology and 50% shall be of subject specific.

Section-A (Research Methodology)

Meaning of Research, Research Process and Scope of Research in various disciplines, Scientific methods of research, selecting a topic of research, Ethics in Research, Methods of data collection –questionnaire/schedule; questionnaire designing, interview and observational Methods, Primary and Secondary sources of data collection, Writing of books and research papers, report writing; pre-writing consideration, thesis writing, format of report writing, formats of publication in research journals, bibliography, referencing and footnotes, major of central tendency, Data analysis using suitable quantitative techniques with application of computers, binary system, octal and hexadecimal system

Section-B (Subject Specific: Electrical Engineering)

Electric Circuit Analysis:

Ideal voltage and current sources, R, L, C elements, Network solution methods: KCL, KVL, Node and Mesh analysis. Network Theorems: Thevenin's, Norton's, Superposition and Maximum Power Transfer theorem, two port networks, balanced three phase circuits, star-delta transformation, Complex power and power factor in AC circuits.

Analog and Digital Electronics:

Simple diode circuits: clipping, clamping, rectifiers, Amplifiers: biasing, equivalent circuit and frequency response, sample and hold circuits. Representation of continuous and discrete time signals, shifting and scaling properties, linear time invariant and causal systems, Laplace Transform and Z transform.

Electrical Machines:

Single phase transformer: open circuit and short circuit tests, Three-phase transformers: connections, parallel operation conditions; Auto-transformer, Electromechanical energy conversion fundamentals. DC machines: separately excited, series and shunt, motoring and

generating mode of operation and their characteristics. Induction motor: operating principle of single-phase induction motors; Three-phase induction machines: Rotating Magnetic field, performance, torque-speed characteristics, starting and speed control. Synchronous machines: cylindrical and salient pole machines, performance and characteristics, Parallel operation of alternators, starting of synchronous motors.

Power Systems:

Basic concepts of electrical power generation, AC and DC transmission concepts, Models and performance of transmission lines, Bus admittance matrix, Gauss- Seidel and Newton-Raphson load flow methods, Voltage and Frequency control, Power factor correction, Symmetrical components, Symmetrical and unsymmetrical fault analysis, directional and distance protection, Circuit breakers, System stability concepts, Equal area criterion.

Power Electronics:

Static V-I characteristics and firing/gating circuits for Thyristor, MOSFET, IGBT; DC to DC conversion: Buck, Boost and Buck-Boost Converters; Voltage and Current commutated Single phase and three-phase voltage and current source inverters, sinusoidal pulse width modulation.

Control Systems:

Mathematical modeling and representation of systems, Feedback principle, transfer function, Block diagrams and Signal flow graphs, Routh-Hurwitz and Nyquist, Root loci.

Electrical and Electronic Measurements:

Bridges and Potentiometers, Measurement of voltage, current, power, energy and power factor; Instrument transformers, multimeters, Oscilloscopes, Error analysis.