



HINDUSTAN PETROLEUM CORPORATION LIMITED

Regd. Office: 17, Jamshedji Tata Road, Mumbai - 400020.

CIN NO: L23201MH1952GOI008858

SYLLABUS FOR ELECTRICAL ENGINEERING POSITIONS

1. Electric Circuits

Fundamentals of AC & DC circuits, AC & DC Network Theorems, Work-Power-Energy. AC Voltage and Current through resistive, inductive and capacitive circuits; R-L, R-C, R-L-C series and parallel circuits; resonance; circuit transient; Initial and Final Value Theorem; star and mesh analysis; relation between line and phase quantities; equivalent circuit; network element symbols and conventions, Nodal analysis; Kirchhoff's Voltage Law (KVL), Kirchhoff's Current Law (KCL), Self and mutual inductance, Fourier Transform; Laplace Transform; balanced three phase circuits; star-delta transformation.

2. Electrical Machines

Transformer construction, equivalent circuit, phasor diagram, per unit impedance, losses, regulation, efficiency, magnetic inrush, effect of saturation, open delta connection; parallel operation, open circuit test, short circuit test, polarity test, voltage and current ratios; auto-transformer; Three-phase induction machines principle of operation, types, performance analysis, equivalent circuit, efficiency and losses, torque-speed characteristics, no-load and blocked-rotor tests, equivalent circuit, starting methods and speed control, regenerative braking; DC machines self and separately excited, series and shunt, motoring and generating mode of operation and their characteristics, starting and speed control of dc motors; Synchronous machines cylindrical and salient pole machines, performance and characteristics, excitation system, regulation and parallel operation of generators, starting of synchronous motors.

3. Power Systems

Basic concepts of electrical power generation, AC and DC transmission concepts, Models and performance of transmission lines and cables, Series and shunt compensation, Electric field distribution and insulators, Distribution systems, Per-unit quantities, load flow methods, Voltage and Frequency control, Power factor correction (Automatic power factor control and VFC controlling), Symmetrical components, Symmetrical and unsymmetrical fault analysis, Principles of over-current, differential, directional and distance protection; Circuit breakers, System stability concepts. Basic concepts of ETAP software for power system analysis, relay co-ordination, Fundamentals of load shedding schemes for system stability, Overview of numerical relays and their application in power system protection, Basic concepts to various communication protocols for substation automation.

4. Power Electronics

Transients; Static V-I characteristics and firing/gating circuits for Thyristor, MOSFET, IGBT; three phase half wave and full wave rectifiers; voltage and current commutated Thyristor based converters; diodes; choppers; power factor and distortion Factor of ac to dc converters; single-phase and three-phase voltage and current source inverters; half bridge and full bridge inverter; sinusoidal pulse width modulation; Variable frequency control; vector control; active and passive filters, Harmonics and harmonics compensation and wireless communication

5. Electrical and Electronic Measurements

Bridges and Potentiometers; current and voltage transformers; ratio error and phase angle; burden; measurement of voltage, current, power, energy and power factor; digital voltmeters and multimeters, Phase, Time and Frequency measurement; error analysis; HV oil testing; Insulation resistance measurement.

6. Electromagnetic Fields

Fundamentals of electrostatics, Electro-chemical power sources: batteries & types, UPS. 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, Ampere's law, Curl, Faraday's law, Lorentz force, Inductance, Magneto motive force, Reluctance, Magnetic circuits, Self and Mutual inductance of simple configurations.

NOTE: The syllabus/topics mentioned are indicative in nature. Candidates are expected to possess significant knowledge/proficiency pertaining to the relevant subjects and their qualifying degree.