भारतीय प्रौद्योगिकी संस्थान जोधपुर
Indian Institute of Technology Jodhpur

WRITTEN EXAM/ TRADE TEST SYLLABUS FOR THE POST OF JUNIOR ENGINEER (ELECTRICAL)

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 magnetics materials Magnetic calculations for conductors of different configuration e.g. straight, circular, solenoidal, etc. Electromagnetic induction, self and mutual induction.
AC Fundamentals	Instantantaneous, peak, R.M.S. and average values of alternating signal, Representation of sinusoidal wave form, simple series and parallel AC Circuits consisting of R.L. and C, Resonance, Tank Circuit. Poly phase system-star and delta connection, 3 phase power, DC and sinusoidal signal 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, Megger, Energy meter AC Bridges. Use of CRO, Signal Generator, CT, PT and their uses. Earth Fault detection.
Electrical Machines	**(a)** D.C. Machine – Construction, Basic Principles of D.C. motors and generators, their characteristics, speed control and starting of D.C. Motors. Method of braking, motor Losses and efficiency of D.C. Machines. **(b)** 1 phase and 3 phase transformers- Constructions, Principles of operation, equivalent circuit, voltage regulation, O.C. and S.C. Tests, Losses and efficiency. Effect of Voltage frequency and wave form on losses, Parallel operation of 1 phase Induction Motors Characteristics and applications. **(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. **(d)** **Synchronous Machines:** Generation of 3 phase e.m.f. armature reaction, voltage regulation, parallel operation of two alternators, synchronizing, control of active and reactive power, Starting and applications of synchronous motors.

Generation, Transmissions 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 and Protection Rating of circuit breakers Principles of arc extinction by oil and air, H.R.C Fuses, Protection against earth leakage, over current, etc. Buchholz relay, Merz-Price system of protection of generators & transformers, Protection of feeders and bus bars, Lighting arresters, various transmissions and distributions 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, electrical installation of machines and relevant rules, Earthling practices and IE Rules.
Utilization of Electrical Engineering:	Illumination, Electric heating, Electric welding, Electroplating, Electric drivers and motors.
Basic Electronics	Working of various electronic devices e.g. P N Junction diodes Transistors (PNP and PNP type), BJT and JFET Simple circuits using these devices.
Air Conditioning	General principles of Refrigeration and Air-conditioning, Terminology, Factors affecting A.C. Load, Psychrometric chart, comfort air conditioning, General principles of window / split air conditioners.
Earthing	Design, Layout, and installation procedures for Building / Substation earth, Lightning protection and Surge protection devices.

TRADE TEST (ELECTRICAL)

1. Work procedure as per CPWD guidelines.
2. Knowledge of computer applications (like MS-Word, Excel, Power Point and E-Mail, etc.
3. Knowledge about the substation equipment like, Transformer, DG sets, RMU, Bus Coupler, Busbar, Relay etc;
4. Knowledge about the LT as well as HT cable laying process;
5. Idea about the fault rectification during any emergency and blackout situation.

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