



All India Institute of Medical Sciences, Jodhpur

Indicative Syllabus for the Examination for the Post of Junior Engineer (Air Conditioning & Refrigeration)

(Syllabus is only indicative. The questions can assess any aspect of knowledge, aptitude, attitude and practical skills, which is expected from a trained person to work efficiently at the advertised post. The number and sequence of questions examining any particular topic / subject may be variable.)

Subject Knowledge of Air conditioning & Refrigeration:

• General –

Knowledge of Indian Electricity Act, Indian Elect. Rules as amended up-to-date. General conditions of supply and charges to be paid to licencees for obtaining connection. CPWD General Specifications for Electrical Works, Principles of analysis of rates. General Principles in preparation of estimates, project reports, award of works and execution of works and measurement. ISI/BIS Standards and Codes of practices.

Internal Electrical Installations - Systems of wiring and their design, distribution system. Apparatus for Control, protection and Testing.

Earthing, Lighting Protection, Safety & Maintenance - Necessity of earthing, earthing resistance, type of earthing. Lighting protection design, layout, material and installation. Safety procedures and practices, principles of equipment installation, preventive maintenance and testing of equipment.

Sub-Station upto 33 KV and Distribution - Layout and Design for indoor and outdoor application. Specification for equipment, Sub- Station earthings, stand-by generating sets, commissioning procedures and tests.

Distribution: Design of overhead line and underground distribution systems. Specification for cables, conductors, Supports etc. Cable joining and termination methods, power factor improvement, service connection to buildings. Air-Conditioning Ventilation - General principles of Refrigeration, Air- Conditioning, evaporative cooling and ventilation, Heating and cooling load estimation. Classification of systems, their design and application, structural requirements, specifications for installations.

Water Supply - Types of pumps and their characteristics. Prime movers, pumping systems and application. Specification for equipment and installation.

• ELECTRICAL APPARATUS –

(i) Single and poly phase A.C. Circuit. Effects of resistance inductance and capacitance.

(ii) Single and poly phase transformers – constructional features, equivalent circuits performance, parallel operation, phase conversion. Separation of losses and determination of efficiency by various methods. Auto transformers.

(iii) Alternators, Constructional features, regulation, parallel operation and Protection. Automatic Voltage regulators, Emergency generating sets, automatic change over.

(iv) Induction machines, polyphaser motor and its principle of operation and equivalent circuit. Torque, slip characteristics. Crawling, methods of starting, single phase motor, its theory, characteristics and application.

- INSTRUMENT TRANSFORMERS, PROTECTIVE RELAYING, MEASUREMENTS - Current, Voltage transformers. Constructional features of IDMT relays, instantaneous relays including knowledge of overload earth fault, undervoltage, Bucholz relays. Connection diagrams, settings. Electrical instruments and Measurements, principles of construction and theory of measuring instruments for direct and alternating currents. Commercial types. Measurement of resistance, Voltage, Current, power, power factor and energy. Watt meters, energy meters. Thermo couples, Resistance Thermometers, Pyro-meters. Fault locating bridges for cables. Measurements of resistance, inductance and capacitance, wheatstone bridge.

- **INTERNAL COMBUSTION ENGINES- Fuels and Combustion.** Fuels and their properties, combustion calculations. Analysis of products of combustion. Power cycles. Vapour power cycles- Carnot and Rankine. Gas Power-Otto and Diesel cycles. Deviation of actual cycles from theoretical cycles. Internal combustion engines – Two and four stroke compression ignition and spark ignition engines. Combustion Phenomena, Detonation, Knocking, scavenging of two stroke engines. Fuel injection and carburation. Lubrication and cooling system performance and testing of IC engines. Pollution control requirements/standards.
- **HEATING, AIR CONDITIONING AND REFRIGERATION- Refrigeration – Refrigeration and heat pump cycles.** Vapour compression, absorption Cycles. Refrigerants and their characteristics. Air Conditioning – Psychrometric chart, comfort air conditioning, comfort indices, ventilation requirements. Cooling and dehumidification methods. Industrial air-conditioning processes. Different methods of electric heating. Construction and performance of Electric heating equipment.
- **WORKSHOP TECHNOLOGY-** Estimation of power and energy requirements of electric welding, different types of equipments used and their characteristics. Manufacturing and Fabricating methods and practices for various electrical and mechanical equipment such as pumps, switch boards, light fittings, AHUs etc.
- **ENERGY CONSERVATION, POWER FACTOR IMPROVEMENT**
Comparison of different types of lamps from the point of energy conservation, calculation of pay back period. Power factor improvement, Reduction of load current and transformer losses due to power factor improvements. KVA requirement for power factor improvement.
- **SOLAR ENERGY UTILISATION-** Solar Hot Water system, principles, constructional features, constituent parts, installation, operation & maintenance, solar photo voltaic system, Advantages/disadvantages of solar heating & solar photo voltaic system.

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