

DETAILED SYLLABUS FOR THE POST OF JUNIOR INSTRUCTOR IN LIFT & ESCALATOR MECHANIC IN INDUSTRIAL TRAINING DEPARTMENT
CAT NO: 653/2023

TOTAL : 100 MARKS

Mechanical

Module.1.Safety , measurement and Basics of elevators – 15 Marks

Common hand tools. Types, measuring tools: tape, dial gauge, scale, try square. Lifting tools: chain block, hoist, pulley, shackle etc. Basic Fabrication: fastening, temporary, semi-permanent and permanent. Nomenclature of derricks used in rigging. Purpose & causes of failure of foundation. Process of welding and brazing. Elevators, types of conveying equipment. Applications and proper use of; Hard hat, Safety belt, lifeline, Barricade, Cut resistance gloves, goggles, dust mask, head lamp, earplug. Emergency equipment of the elevator; Emergency light, Automatic rescue device, door sensor, emergency alarm. Components of elevator; Types of elevator Capacity and speed of the Elevator. Moving walkways. Methods for Template setting. Hoist way measurement, Bracket measurement & fixing. Guide rail hoisting. Concept of counter weight, buffer, car frame, emergency stop switch. Different types of door, landing zone, top over travel, head room, etc.

Module. 2.Maintenance of elevators / lifts – 20 Marks

Methods and types of maintenance. Preventive maintenance, running maintenance and breakdown maintenance. Types of lubricants, its properties and use in lifts. Disadvantage of improper lubrication. Overhead clearance, car bottom clearance, Common safety features of elevator, overload, fire, earth quake. Types of elevator; passenger elevator, service elevator, freight elevator. Concept of elevator well, elevator pit, pit depth. Types and procedure of fixing Guide rails, reed switch magnet. Importance of Running clearance. Types of Ropes, Coated steel belt. Importance of car top Inspection. Electromagnetic brakes for lifts. Types of Drum, pulleys, guiding shoes, cam, toe guard, retiring cam, limit cam and sheave used in lift. Process of fixing Machine beam and beam support. Dead end hitch, spur gear and worm gear. Difference between Geared and Gearless machines. Components of Car Operating Panel. Hall fixture and lantern. Compensation chain, cage bulldog clip, governor tension weight and counter screen. Types of Doors and procedure of installation. Cage fitting, function of isolation. Procedure of travelling cable installation. Types of scaffolding, Concept of scaffoldless installation system. Commissioning steps. Types of governor and pulley and types of Car gate. Space required for the erection of lift of different capacity. Required

car area according to No. of passengers. Selection of elevator speed for various types of lift. Capacity of elevator; Selection of location of Lift Machine. Selection of rope, guide rail, buffers, counter weight etc.

Module .3. System functions in Escalator/ Lift – 15 Marks

Types of Escalator arrangements: parallel, multiple parallel, cross over. Typical applications. Moving walkways and applications. Selection of speed, step widths, inclination. Boarding and alighting areas, Pits and supports Components/ Parts of escalators. Step parts and assemblies, Step chain parts and assemblies, Comb plate parts, Hand rails and related parts. Lubrication system, Covers, Decking, trim plates, panels, etc. Barriers, barrier assembly and caution plates. Different types of bearings used in lift. Gear and worm wheel used in lift and their function. Functions of various parts of governor. Types of springs, function and use. Automatic levelling devices. System of levelling and alignment. Types of Shaft and shaft coupling. Function of emergency cut out in trip system. Necessity of electrical/mechanical interlocks. Importance of recording parameters and other service records of lift. Explanation and function of Auto Rescue Device. Procedure of getting elevator license and commissioning certificate.

Electrical

Module .4 - Basic Electricity – 10 Marks

Fundamentals of electricity, conductors, insulators and semiconductors. Wires and cables, soldering, Types & properties of resistors. Specific Resistance. Ohm's Law, Laws of Resistance. Series, parallel and combination circuits. Kirchhoff's Laws. Wheatstone bridge: principle and its applications. DC circuits, Single phase and polyphase circuits and related terms. Inductive and Capacitive Reactance, Impedance, power factor. Active, apparent and Reactive power. Single phase and three-phase systems. Three-phase Star and Delta connection. Line and phase voltage, current and power in a 3 phase circuits with balanced and unbalanced load. Electrical Measuring Instruments; Classification, various types and uses.

Module .5 - Effects of electric current and protection – 10 Marks

Magnetism, Classification of magnetic materials.

Principle of electro-magnetism, Magnetism: Laws and terminology. Electrostatics: Capacitor Different types, functions and uses. Chemical effect of electric current, electrolysis, Cells, methods of charging, Lead Acid cell, general defects and remedies.

Grouping of cells for specified voltage and current. Common Electrical wiring accessories, their specifications, specification of Fire alarm, Fuses, MCB, ELCB, and MCCB. Earthing - Principle and different methods of earthing, Importance of Earthing and its rules.

Module .6 - AC & DC Machines – 10 Marks

Indian Electricity rules pertaining to operation, construction and maintenance of Lifts and Escalators. Types of switches for control & power wiring. Types of Thermostats, timers and mercury switches. Single Phase Transformer: Types and Classification, specification and emf equation, turns ratio and efficiency. Three Phase Transformer: Types & Connections. Auto Transformer and instrument transformers, CT & PT. Single phase AC motors: Working principle, construction, Characteristics, testing, Starting methods and applications. Three phase induction motors: Characteristics, Starting methods and applications of poly phase induction motor. Construction and working principle of synchronous motor. Construction and working principle of Permanent magnet synchronous motor Size/ rating of motor applicable for lift and escalator. Effects of faulty power supply, i.e. single phasing, loose contact, improper voltage etc. Construction and types of DC motors, Starting and Speed control methods. DC Generators: types, emf equation, armature reaction and commutation. Different characteristics of DC Generators. Various control systems of lift and their utility. Rheostat control and variable voltage control. Single speed, double speed and logic circuit control. Automatic levelling with change of load. Auxiliary motor micro drive. Electrical and control parts. Automatic levelling with main motor at various speeds. The floor selector type, hoist way switching devices. Alarming system. Types of limit switch and their application.

Electronics

Module .7 - Basic Electronics – 10 Marks

Semiconductor Theory-P type and N-type materials, P-N junction, classification, specifications, biasing and characteristics of diodes. Rectifier circuits - half wave, full wave, bridge rectifiers and filters. Principle of operation, types, characteristics and various configuration of transistor. Application of transistor as a switch, voltage regulator and amplifier.

Module .8 - Electronic power devices and drives – 10 Marks

Types of electronic power devices. Working principle of SCR, DIAC & TRIAC, GTO, UJT, FET, JFET, MOSFET, IGBT. Biasing FET as amplifier and switch. UPS, Inverter and Battery charger. Analog to Digital converter Digital to analog converter,

Buffer Applications of power electronic devices. Introduction to CRO Types of oscillators and multivibrators. Logic gates and ICs Combinational circuits and its classification. Number system, Registers, Counters and Timers. Digital memory types; ROM, RAM, EPROM. Functions of AC and DC drives. Terminal connections; control and power circuit Basic parameter setting in Variable Voltage Variable Frequency (VVVF) drive. Size and selection of drives used in lifts and escalators. Study of Specific control logic for lift motor operation. Parameter settings of drives for lift motor operation. Speed control of motor by thyristor. Basics of stepper and servomotors.

NOTE: - It may be noted that apart from the topics detailed above, questions from other topics prescribed for the educational qualification of the post may also appear in the question paper. There is no undertaking that all the topics above may be covered in the question paper.