

KERALA PUBLIC SERVICE COMMISSION

DETAILED SYLLABUS FOR THE POST OF TRADESMAN (INSTRUMENT TECHNOLOGY) IN TECHNICAL EDUCATION DEPARTMENT (Cat No.886/2025)

Total marks : 100

Unit I: Importance of Safety and basics of fitting (10 Marks)

Safety Precaution – First Aid – PPEs – Response to emergencies e.g. power failure, fire and system failure – Importance of House Keeping and Good Shop Floor Practices – Occupational Safety and Health, Description, Construction and Uses of Different hand tools such as Files, Chisels, Hacksaw and Hammer etc. Description, construction and uses of different marking tools such as Steel Rule, Caliper, Punches, Scribing block etc. – Job Holding Devices – Linear Measurement – Drilling, Reaming and Treading. Precision Measuring Instruments-Vernier Calipers, Micrometers, Gauge blocks, Sine bar, Dial indicators, Bevel protractor, Thickness gauges. Element & types of screw threads used in instruments, Calculation of drill size for tapping. Types of tubes used for instrumentation. Tube cutter, Flaring tools, Swedging tools, equipment's & fixture required for pipe bending, straightening, thread cutting etc.

Unit II: Basic of Electricity (10 Marks)

Electrical components conductor, semiconductor & insulators. Standard wire gauge (SWG). Introduction of electricity- static electricity. Current, voltage, P.D, E.M.F, resistance. Electrical circuit - D.C & A.C circuit differences. Importance of grounding. Ohm's law & Kirchhoff's laws. Series & parallel circuits. Primary & secondary cells and batteries. (Liquid & dry). Switches and types. Magnet and magnetism, magnetic properties. Explanation of Electro-magnetism, application-types E.M. relays, Principles of alternating current, A.C & DC electricity, types of wave forms, time period and frequency, peak to peak values, RMS values, Average values. Introduction of AC and DC generators working principles, EMF equation. Faraday's Law, Lenz's Law, Fleming's left Hand and right-hand rules. DC motors working principles, Different speed controlling techniques of DC motors. AC motors, induction motors, three phase motors, stepper motors. Transformer, types, transformation ratio. Open circuit test and short circuit test, regulation Autotransformer. Current measurement, Instrument transformer, Potential transformer and current transformer.

Unit III: Electrical Measuring Instruments (10 Marks)

Types of Switches – SPST, SPDT, DPST, DPDT, Toggle etc. – Types of Electrical Measuring Instruments – Moving Coil and Moving Iron, Construction and working principles of Ammeter, Voltmeter, Wattmeter, Multi meter, Clamp meter, LCR meter, Energy Meter, Megger, P.F Meter, Frequency meter, Synchronous meter etc.

Unit III: Basics of Electronics and Electronic Measuring Instruments (10 Marks)

Resistors – Different Types of resistors and their properties – Different methods of measuring values of resistance – Capacitor – Construction details, charging, discharging, types of capacitor, unit of capacitance, energy stored in capacitors. Capacitors in series and parallel. Capacitors in DC circuit. A.C. impedance, Inductive reactance, capacitive reactance. Inductor and Inductance, types of inductors, Factors affecting the value of inductance, self inductance (L), Capacitance AC current through - R, L, C circuits. Resonance in RLC circuit. Importance - of series and parallel resonance. Soldering – Different type of Soldering guns, relate temperature with wattages, Types of tips-Solder materials and their grading – Use of wax and other materials – Selection of a soldering gun for specific requirement – Soldering and De-soldering stations and their specification – Study of Semiconductor – Semiconductor types and characteristics – Rectifier and its types – Filters –

Transistors and its types-FET, MOSFET – Voltage Regulators – Introduction and purpose of Regulators –Operational Amplifier circuits-Digital Electronics- Different logic gates and its truth table, Flip flop circuits – UPS – Types of UPS – Most frequently occurring faults and their remedies – Concept of UPS, Offline and Online – Difference between Inverters and UPS – Advanced Communication – Need of Modulation, Types of Modulation. Demodulation Techniques – Introduction to AM, FM and PWM.

Unit IV: Basic Computer Hardware (10 Marks)

Basic blocks of a computer – Components of desktop and mother board Hardware and software – I/O devices, and their working – Different types of printers – HDD – DVD – Various ports in the computer Windows OS MS Widows – Starting windows and its operation – file management using explorer– Display & sound properties – Screen Savers – Font Management – Installation of Program – Setting and using of Control Panel – Application of Accessories – Various IT tools and applications – Concept of word processing – MS word – Excel – Introduction to Power Point Basics of preparing slides, different design aspects of slides, animation with slides etc – Concept of Internet – Computer, Networking, Network features – Network Medias – Network topologies – Protocols- TCP/IP, UDP, FTP, models and types – Specification and standards – types of cables – UTP – STP– Coaxial cables – Network components like Hub – Ethernet switch – Router – NIC Cards – Connectors – Media and Firewall – Difference between PC & Server.

Unit VI: Introduction to Instrumentation and Pressure Measurement (10 Marks)

Scope and necessity of instrumentation – Fundamentals of measurement systems – functional block diagram of measurement system – Calibration and calibration standards – Basic standards– Secondary Standards – Working Standards – Fundamental Units – The Metric System – Base & Supplementary Units – Derived Units – Multiplying factors and standards of Length, Mass, Time, & Frequency – Basic Instrumentation Symbols – Static Characteristics – Dynamic Characteristics – Definition of pressure – Types of pressure – Barometric (Atmospheric) Pressure, Gauge Pressure, Differential Pressure – Absolute Pressure – Vacuum pressure & their units – Types of pressure sensing elements – Bourdon Tube – Diaphragms – Capsules and Bellows – Each one types, shapes, material used for various applications – Ranges – Advantages and Limitations – Pressure switches Types and Applications – Different type of Pressure measuring Instruments – Manometers – Gauges – Method of Pressure Instrument Calibration – Dead weight tester and comparators – Electrical pressure transducers – Potentio-metric pressure transducers – Capacitive pressure transducers – Strain Gauge Pressure Transducers – Piezoelectric – Differentials pressure transducers –Types of Pressure transmitters – principle of construction of different Electronic Transmitters – Study of Pressure Safety valve – Pressure Switch manifolds – Classification of Transmitter such 3-Wire& 4-wire Transmitter.

Unit VII: Temperature Measurement (10 Marks)

Definition – Temperature scale and Units of Temperature and their conversion in between units – Expansion Methods for Temperature Measurement – Liquid Expansion Type – Solid Expansion Type –Gas Expansion Type – Thermistor – Thermocouple and RTD their ranges – Construction – Principle of Operation – Thermocouples Ex-tension wires – Compensating for Changes in Reference Junction Temperature – Construction of Thermocouple Junction – Types of Thermocouple – Advantages and Disadvantages of Thermocouples – Types of Temperature Transmitter – Types of Temperature Indicator – Temperature Scanner – Pyrometry – Pyrometers and Wave Lengths – Using of Optical and Radiation Pyrometer – Types of pyrometers IR Temperature Guns, Radiation and Filament Type – Introduction of Temperature Calibrator.

Unit VIII: Flow Measurement (10 Marks)

Basic properties of fluids – Fluids in motion – Getting fluids to flow – Units of flow rate and quantity flow – Factors affecting flow rate – Relation between flow rate and pressure, area, quantity

– Types of flow meters – head type, variable area type, quantitative flow meters – Principle of open channel flow, weirs, notches and flumes – Various shapes and their applications – Variable area type flow meter- rotameter, constructions, working principle, applications – Various shapes of float – Type of materials used for body and float – Factors affecting rotameter performance, measuring gas and liquid flow – Turbine flow meter – Magnetic flow meters – Vortex flow meter – Ultrasonic flow meter – Thermal mass flow meter – Advantages and Disadvantage – Coriolis Mass flow meter – Metering the flow of solid particles

Unit IX: Liquid Level and Solid Level Measurement (10 Marks)

Types of level measurements-solid and liquid – Mechanical and Electrical type – Storage tank gauges, sight glasses, buoyancy – Factors need to consider for open and closed channel level measurements – Level Switches – Electrical method conductivity and capacitance method for Measuring the liquid level – Capacitance probes zero and span adjustments – Ultrasonic level detectors – Diaphragm switch – Using weight to determine level – Ultrasonic solid level measurement with microwaves – Using capacitance probes to measure solid level and point type level detection – Differential pressure measurement Diaphragm and Air Trap Electronic Level Measuring Instrument – Variable capacitance - Ultrasonic and Magnetic type level Switches – Radar Type Level Measurement and Level measurement by Load cell.

Unit X: Calibration and Final Control Element (10 Marks)

Classification of instrument according to accuracy – Generation of calibration report – Hart communicator and calibrator – Universal Calibrator – PH simulator – Conductivity simulator – Principle, Construction, operation of I to P, and P to I Converters – Types of Manometer (ELECTRONIC and PNEUMATIC) – Recorders – Smart Devices- HART transmitters, Its advantages and applications – HART protocol – HART communicators and PC based HART device configuration – Steps in calibration of HART devices – Controllers – Chemical Plant Introduction - Transmitters, valves, process vessels, controller and software – Final Control Element- Control valves – Control valves functions and components – Types of control valves – Based on valve flow characteristics - linear, equal percentage, Quick Opening Valves – Globe Valves – Cage Valves – Butterfly Valves – Ball Valves – Sliding Gate Valves – Diaphragm Valves – Split Body Valves – Capacitive, Inductive Type valve – Proximity Switch – IR switch – Micro Switch – Limit Switch – Role Of pneumatic and Electronic valve positioner – Solenoid valve – Piping Houses and fittings – Introduction to programmable controllers – Difference between DCS and PLC – Fundamentals of SCADA and DCS

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.