

PUNJAB PUBLIC SERVICE COMMISSION

Syllabus of Mechanical/Electronic Engineers for the Posts of Junior Engineer (Mechanical/Electronic Engineers)

1. **ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING:** Basic electrical quantities, DC Circuits, Ohm's law, resistances in series and parallel, Kirchhoff's laws and their applications in solving electrical network problems, Network theorems such as Thevenin's theorem, superposition theorem, Maximum power transfer theorem and Norton's theorem, Star-delta transformation. Current and voltage sources and their conversion.
Semi-conductor Theory - Atomic structure and Energy band theory, intrinsic and extrinsic semiconductors and effect of temperature on them; Semiconductor Diodes, forward and reverse biasing of a PN junction, Breakdown mechanism; characteristics, static and dynamic resistance; Half wave and full wave rectifiers using diodes, PNP and NPN transistors, Transistor configurations: common base (CB), common emitter (CE) and common collector (CC), Transistor Biasing and Stabilization, operating point and effect of temperature, Single-Stage Transistor Amplifiers - Concept of DC and AC load line, Voltage gain, Concept of input and output impedance, AC equivalent circuit, voltage gain, Frequency RC coupled two-stage and direct coupled amplifier, Construction, operation, characteristics and applications of JFET and MOSFET
2. **ELECTRICAL CIRCUITS AND MACHINES:** Concept of alternating current and voltage, average value, r.m.s value, form factor, power factor etc., Phasor algebra, AC Circuits, susceptance, conductance and admittance, Active and reactive components of current and their significance, Power, Power factor and its significance, Resonance in series and parallel circuits. Faraday's laws, magnetization curve, constructional features of generators and motors, **D.C. Machine:** basic principles, emf equation, description of different parts and working, different types, characteristics and applications of D.C. machines. **Transformers:** Constructional details: selection of core material and winding materials, insulating materials, core and coil construction, **1-phase Transformers:** E.m.f. equation, phasor diagram under no-load and load conditions, equivalent circuit and circuit parameters, Regulation, Losses and efficiency (including all-day efficiency), S.C. and O.C. Distribution and power transformers, 1-phase Autotransformer, **Three-phase transformer:** Single unit or 3 single-phase units connections, Vector grouping, Scott-connected transformer, 3-phase transformers in parallel.
3. **ELEMENTS OF MECHANICAL ENGINEERING:** Thermodynamics: Energy, laws of Thermodynamics, Heat and work, Enthalpy. Reversible and irreversible processes, Entropy, Description of various Types of Boilers. Basic concepts of Thermal conduction, convection and radiation. Concept of black opaque and white bodies, Stefan Boltzman's laws. Strength of Materials: Concept of Bending Moment and Shear Force, Bending Moment and Shear Force diagrams for cantilevers, simply supported beams to concentrated loads, Concept of Torsion and equation of torsion for circular shaft, Close coiled spring for axial load, Stiffness of spring, angle of twist and proof resilience.
4. **MANUFACTURING PROCESSES:** Dry sand and green sand casting: casting defects: Die casting, Continuous casting and Centrifugal casting, Welding Process: Gas welding, Arc welding, Resistance welding; Thermit Welding: Soldering, Welding defect and precautions, Elements of metal cutting tools, tool geometry, cutting fluids, lathe and milling operations: Grinding process, grinding wheel: gear generation processes; Electric discharge machinery, ultrasonic machining, electrochemical grinding, Forming processes: Hot and Cold working: Rolling: Punching blanking, shearing.
5. **ENGINEERING MATERIALS:** Introduction of Engineering materials, Ferrous materials, alloying materials, Non-Ferrous metals, aluminum and its alloys, High speed steel, Plastic materials, hardening and hardening processes, Time temperature transformation curve.
6. **MEASUREMENT AND MEASURING INSTRUMENTS:** Static and dynamic characteristics, Classification of electrical measuring instruments, Deflection torque and methods of production, controlling torque and controlling system, Damping torque & methods of damping, Different types of instruments: Construction & operating principle, Merits and demerits, Errors and remedies, Thermocouple instruments. Digital instruments: Voltmeter, ammeter, multimeter, energy-meter;

Wheatstone bridge.

Standard of measurements, Line and wave lengths, Limits and tolerances, Angular measurements, Slip gauges, Screw thread measurement: Major and minor diameters, Pitch, Angle and effective diameter. Types of comparators: Mechanical, electrical, and optical type, Wire gauge, Feeler gauge, Toolmaker's Microscope. Measurement of Displacement and Strain: Wire wound potentiometer, LVDT, strain gauges and their different types such as inductance type, resistive type, wire and foil type etc. Gauge factor, gauge materials, and their selections.

- 7. BASICS OF MANAGEMENT:** Introduction, Leadership, Motivation, Ethics and Values, Team related skills- sympathy, empathy, co-operation, concern, lead and negotiate, work well with people from culturally diverse background, Communication in group - conversation and listening skills, Task Initiation, Task Planning, Task execution, Task close out, Customer Relationship Management (CRM), Need, various types of customers, customer satisfaction, life- long customer, Customer Satisfaction Index (CSI) and its significance, Elementary knowledge of Income Tax, Sales Tax, Excise Duty, Provident Fund, Employees State Insurance Act, Labour welfare schemes, Labour laws, worker and public safety techniques, systems of wage payment, incentives, Factory Act 1948 with special reference to health, safety and welfare measures, working hours, annual leave with wages, Payment of Wages Act 1936, Minimum Wages Act 1948, safeguards in construction practices, Introduction to Total Quality Management (TQM), Community Participation in Water Supply and Sanitation, Roll of Women in Water Supply and Sanitation etc.