

## **SYLLABUS FOR THE POST OF TECHNICIAN: MECHANICAL ENGINEERING**

### **Mental Ability, Reasoning and Mathematical Skills:**

Analogy, series completion, coding-decoding, blood relations, logical venn diagrams, alphabetical test, number ranking and time sequence test, *mathematical* operations, arithmetical *reasoning*, data interpretation, data sufficiency, cubes and dice, construction of sequences and triangles.

Mathematics based on tenth standard of CBSE

### **Computer awareness**

Components of a computer system, specifications of a computer system, Input and output devices and installation of printers and other input output devices., Introduction to Internet and Internet Applications, MS windows, MS-Word, MS-Excel, MS Power Point, MS Access, Computer Networking, Computer shortcut keys, Virus and virus protection, Operating System types.

### **English Language Proficiency**

English language based on tenth standard of CBSE

### **Post Specific**

**Manufacturing Process:** 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 and Brazing: Welding defects and precautions, Elements of metal cutting; Cutting tools, tool geometry, cutting fluids; Lathe and Milling operations: Grinding process, grinding wheel; Introduction to Broaching and gear generation processes; Electric Discharge Machining, Electro Chemical Machining, Water Jet machining and ultrasonic machining. Forming processes: Hot and Cold working: Rolling: Punching, blanking, shearing, spinning. CNC machines: Constructional details, operation, tooling and part programming.

**Computer Aided Drafting & Modeling:** Tool bars in Auto CAD, coordinate system, snap, grid, and ortho mode (Absolute, Relative and Polar); Drawing commands – point, line, arc, circle, ellipse; Editing commands – scale, erase, copy, stretch, lengthen and explode; Dimensioning and placing text in drawing area; Sectioning and hatching; Inquiry for different parameters of drawing entity; Create layers within a drawing; Specifying Geometrical Dimensioning & tolerancing; Introduction to Assembly Modeling & Approaches – Top down and Bottom up approach, Applying Standard Mates- Coincident, Parallel, Perpendicular, Tangent, Concentric, Lock, Distance, Angle. Applying Advanced Mates – Symmetric, Width, Path Mate, Linear/Linear Coupler, Limit Mate. Applying Mechanical Mates – Cam, Hinge, Gear, Rack Pinion, Screw, and Universal Joint. Creating Pattern - Assembly Pattern, Mirror, Creating Explode Views

**Mechanics of Solids:** Concepts of bending moment and shear force. Bending moment and shear force diagrams for cantilevers, simply supported beams, overhanging beams subjected to concentrated and Uniformly distributed load. Concepts of torsion. Derivation of torsion equation for circular shafts. Close coiled helical spring subjected to axial load and twisting moment, stiffness of a spring, its angle of twist, strain energy and proof resilience.

**Metrology:** Necessity and importance of Metrology in Engineering field, standards of measurements, line and wave length: Limits, fits and tolerances. Concept of interchangeability. Angle and Taper Measurements: Slip gages and dial indicator in taper measurement. Screw Thread Measurements: Measurements of Major diameter. Minor diameter, effective diameter, pitch. Angle and Form of threads for external and internal threads. Comparator: Types of Comparators (Mechanical, optical, electrical, electronic and pneumatic). Limit gauges: Go and No-go gauges. Alignment tests on lathe. Drilling machine. Milling machine and grinding machine.

**Materials and Metallurgy:** Introduction to Engineering materials, ferrous and nonferrous materials: Pig iron, grey and white cast iron, alloying elements in steel and their effect. High speed steel, heat resistant steel and spring steel. Aluminum and its alloys. Bearing metals. Plastic materials, refractory materials, tempering, hardening and surface hardening processes, selection of materials for different components.

**Industrial Engineering:** Work study, uses of work study: Objectives and basic procedure of Method study and work measurements. Types of inspection, inspection at various stages. Quality control: its advantages: Statistical quality control. Control charts and sampling plans. Types of production: Materials requirements planning, Plant location and layout, types of layouts and their comparison. Importance and advantages of standardization. Cost reduction through standardization. Management of men, materials and machines. Types of industrial organizations: Wages and incentives, trade unions: Role of technician in industry.

**Thermal Engineering:** Basic concept of Thermodynamics : Energy, Thermodynamics systems, types (open and closed) Heat and work, specific heat, Enthalpy, laws of thermodynamics: Zeroth, First and Second Laws, Reversible and irreversible process, Entropy. Basic concepts of thermal conduction, convection and radiation. Basic equations of different cases of Conduction. Convection (natural and forced) and radiation. Concept of Black, white and opaque bodies, Stefan Boltzman's laws. Auto Engine : Internal and external combustion Engines, Engine terminology, Classification of engines, Concept of 2-stroke and 4-stroke engines. Engine Components – construction details, function and working. IC Engine Testing and determination of different parameters.

**Refrigeration and Air Conditioning:** Basic concepts and principles of refrigeration: Refrigeration methods. Air refrigeration cycle, vapour compression cycle, simple vapour absorption cycle, their applications and limitations. Refrigerants: Important properties of refrigerants, properties and applications of commonly used refrigerants such as R11, R12, R22, NH<sub>3</sub> etc. Air conditioning, its concepts. Human comfort, application of air conditioning, Description of room air conditioning, packages air conditioner, central air conditioning system.

**Theory of Machines:** Simple mechanisms: Flywheels, Co-efficient of friction, Motion of a body along horizontal and inclined planes. Friction in screw jack, friction between nut and screw square and V-threads. Concept of power transmission, various power transmission systems with their merits and demerits. Flat and V-belts drives, ratio of tensions. Horse power transmitted, centrifugal tension, condition for maximum power transmission, and function of governors. Sensitivity, Stability, Synchronism and Hunting of governors, description and simple problems on Watt, Porter and Hartnell governor.

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