

## SYLLABUS FOR THE POST OF JUNIOR ENGINEER (MECHANICAL)

|   |                                |                  |
|---|--------------------------------|------------------|
| General Knowledge / Awareness                                   | 10 questions                   | 10 Marks         |
| Mental Ability / Reasoning                                      | 10 questions                   | 10 Marks         |
| Mathematical Ability  | 10 questions                   | 10 Marks         |
| Language Proficiency (Punjabi & English)                        | 10 questions each 20 questions | 20 marks         |
| Professional (As per prescribed qualifications for job related) | 50 questions                   | 50 Marks         |
| <b>Total</b>  | <b>100 questions</b>           | <b>100 Marks</b> |

**GENERAL KNOWLEDGE / AWARENESS (NATIONAL AND INTERNATIONAL) (10 Q):** General information about the state of Punjab and India, Economy, Science and Technology, Current Events), Political Awareness/Polity, Persons in News, Places in News, Important Awards & Honors, Sports.

**MATHEMATICAL ABILITY (10 Q):** Number system, Simplification, HCF & LCM, Percentage, Average, Ratio & Proportion, Profit & Loss, Partnership, Time and Work, Time and Distance, Permutations & Combinations, Probability.

**MENTAL ABILITY / REASONING (10 Q)** Reasoning Ability: Analogy / Analogous Problems, Classification, Word formation, Ranking / Arrangement, Series, Coding & Decoding, Distance and Direction, Symbol & Notation, Scheduled Day or Date, problem based on Ages and Calendar, Data Interpretation.

### **LANGUAGE PROFICIENCY (ENGLISH 10 Q, PUNJABI 10 Q)**

- i. General English up to 10th standard
- ii. General Punjabi up to 10th standard

### **PROFESSIONAL (50 Q)**

#### **PROFESSIONAL SYLLABUS FOR EXAMINATION FOR THE POST OF J.E. IN MECHANICAL ENGINEERING**

**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, 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. Thermal engineering:

**Basic concepts of Thermodynamics:** Energy, laws of Thermodynamics, Heat and work, Enthalpy. Reversible and irreversible processes, Entropy. Description of various Types of Boilers. Basic concept of Thermal conduction, convection and radiation. Concept of black opaque and white bodies, Stefan Boltzman's laws.

**Mechanics of solids:** 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, Mohr's circle, Close coiled spring for axial load, Stiffness of spring, angle of twist and proof resilience.

**Metrology:** Concept of Metrology and necessity of it, 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, Tool maker's Microscope.

**Materials and Metallurgy:** 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.

**Industrial Engineering and Management:** Concept of Work Study, Uses of work study: Objective and basic procedure of method study and work measurement. Types of Inspection, quality control and its advantages, Types of production: Material requirement for planning, plant location, layout of plant. Types of industrial organization; Wages and incentives, Trade unions, Role of Manager in industries.

**Refrigeration and Air-conditioning:** Basic concepts of Refrigeration, Refrigeration cycles and methods. Air refrigeration cycles, vapors compression cycle, simple vapors absorption cycle, their applications, Refrigerants, R12, NH<sub>3</sub>, CCl<sub>2</sub>F<sub>2</sub>. Air-conditioning and its concept, Psychometric processes

**Theory of Machines:** Simple Mechanism: Flywheel, Co-efficient of friction, motion of a body along horizontal and inclined planes. Friction in screw jack, friction between nut and square screw threads. Concept of Power transmission, various power transmission systems with their merits and demerits. Flat and V-belt drives, ratio of tensions. Function of governors. Definition of sensitivity, stability and hunting of governors, Description and simple problem on Watt, Porter and Hartnell governors.