

1. Engineering Drawing:

- a) Engineering Drawing: Introduction and its importance Different types of standards used in engineering drawing. Drawing Instruments: their uses Drawing board, T-Square, Drafter (Drafting M/c), Set Squares, Protractor, Drawing Instrument Box (Compass, Dividers, Scale, Diagonal Scales etc.), Pencils of different Grades, Drawing pins / Clips.
- b) Lines : types and applications in Drawing as per BIS SP:46-2003 Drawing geometrical object using all types of lines. Drawing of Geometrical Figures: Angle, Triangle, Square, Rectangle and Circle. Letters: - Lettering styles, Single stroke letters and numbers as per IS standard. Lettering practice
- c) Dimensioning- Types of dimension, elements of dimensions, Methods of indicating values, Arrangement, Alignment and indication of dimensions. Scales:-Types use and construction. Representative factor of scale.
- d) Method of presentation of Engineering Drawing - Pictorial View - Orthogonal View - Isometric view
- e) Constructions: - Draw proportionate free hand sketches of plane figures. Sketch horizontal, vertical and inclined line by free hand, Draw circles by free hand using square and radial line method, Draw arcs and ellipse by free hand
- f) Projections: Concept of axes plane and quadrant. Orthographic projections Method of first angle and third angle projections (definition and difference) Symbol of 1st angle and 3rd angle projection as per IS specification. Free hand Drawing of Orthographic projection from isometric/3D view of geometrical blocks
- g) Screw :- Its Types and Sizes, Screw thread, their standard forms as per BIS, external and internal thread.
- h) Rivets and Joints:- Prepare a drawing sheet on rivets nomenclature and Joints.
- i) Free hand Sketches for simple pipe line with general fittings.
- j) Reading of drawing. Simple exercises related to missing lines, dimensions. How to make queries.
- k) Simple exercises related to trade related symbols. Basic electrical and electronic symbols
- l) Free hand sketch of trade related components / parts /cutting tool indicating angles.

2. Workshop Science & Calculation

- a) Units & Measurements- FPS, CGS, MKS/SI unit, unit of length, Mass and time. Fundamentals and derived units Conversion of units and applied problems.
- b) Material Science : properties - Physical & Mechanical, Types - Ferrous & Non-Ferrous, difference between Ferrous and Non-Ferrous metals
- c) Mass .Weight and Density : Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density,
- d) Speed and Velocity: Rest and motion, speed, velocity, difference between speed and velocity, acceleration, retardation. Average Velocity, Acceleration & Retardation. Related problems. Circular Motion: Relation between circular motion and Linear motion, Centrifugal force,

Centripetal force

- e) Ratio & Proportion: Simple calculation on related problems. Percentage: Introduction, Simple calculation.
- f) Work, Power and Energy: work, unit of work, power, unit of power, Horse power of engines, mechanical efficiency, energy, use of energy, potential and kinetic energy, examples of potential energy and kinetic energy. Meaning of H.P., I.H.P., B.H.P., and F.H.P. and CC and Torque.
- g) Algebra: Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).
- h) Heat & Temperature: Heat and temperature, their units, difference between heat and temperature, boiling point, melting point, scale of temperature, relation between different scale of temperature, Thermometer, pyrometer, transmission of heat, conduction, convection, radiation.
- i) Mensuration: Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle, Volume of solids - cube, cuboid, cylinder and Sphere. Surface area of solids -cube, cuboid, cylinder and Sphere. Volume of cut-out solids: hollow cylinders, frustum of cone, block section. Volume of simple solid blocks.
- j) Basic Electricity: Introduction, use of electricity, how electricity is produced, Types of current_ AC, DC, their comparison, voltage, resistance, their units. Conductor, insulator, Types of connections - series, parallel, electric power, Horse power, energy, unit of electrical energy. Concept of earthing.
- k) Simple machines Transmission of power: - Transmission of power by belt, pulleys & gear drive. Heat treatment process: - Heat treatment and advantages. 15 Annealing, Normalizing, Hardening, Tempering.
- l) Trigonometry: Trigonometrical ratios, measurement of angles. Trigonometric tables. Finding the value of unknown sides and angles of a triangle by Trigonometrical method. Finding height and distance by trigonometry. Application of trigonometry in shop problems. (viz. taper angle calculation). Calculate the area of triangle by using trigonometry and application of Pythagoras theorem.
- m) Concept of pressure - Definition:-Force, Pressure, and their units, atmospheric pressure, gauges used for measuring pressure, problems. Introduction to pneumatics & hydraulics systems.

3. Technical Training :

- a) Safety: - its importance, classification, personal, general, workshop and job safety. Occupational health and safety. Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. Preventive measures for electrical accidents & steps to be taken in such accidents. Importance of housekeeping & good shop floor practices. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. Fire& safety: Use of Fire extinguishers.
- b) Method of heating iron, use of various Fire Zones in a forge while heating.
- c) Method of Hand Hammer practice, Forging various cross sections.
- d) Use of Tongs, Hammers and Anvil etc. Reading of Brass Rule, use of caliper for measurement.

- e) Sledge Hammer practice, Drawing out, Jumping operations, method of various sledge-hammer, Fuller, Swages, and swage Block etc.
- f) Forge flat taper, Round taper, Square and Hexagon tapers with correct size.
- g) Drawing out various cross sections of square, Round, Hexagon Octagon etc.
- h) Forging of various chisels, Flat, crosscut, Diamond point and, Round Nose etc.
- i) Forging of Bolts & Rivets by using Bolster.
- j) Forging of Spanners, Box spanners and Ring spanners, use of punches and drifts.
- k) Bending of solid Bars in different cross sections. Cold and Hot method.
- l) Hardening and tempering of chisels and other cutting tools. Use of colour chart. Practice of annealing & Normalising of steel, by using open fire test by hammer.
- m) Hardening and tempering of chisels and other cutting tools. Use of colour chart. Practice of annealing & Normalising of steel, by using open fire test by hammer.
- n) Method of operating Oil Fired Furnace and power Hammer practice. Forging various cross section by using power Hammer. (a) Round to Square. (b) Square to Round.
- o) Drawing out and setting out operation using power hammer. Forging a cube using a power hammer.
- p) Forging different types of forgings such as Die casts the help of power Familiarization of tools and equipment used in sheet-metal: Practice on marking and cutting of sheets.
- q) Practice on Forming different shapes in sheets Forming Funnel, Rectangular Boxes, Riveting and Grooving by using stakes. Fabrication of sheet metal container by soldering and Brazing.
- r) Safety precaution observed while using Electrical Furnace and construction detail of Heat-Treating Furnace. Operating of Furnace and their controls. (a) Oil Fired Furnace. (b) Electric Furnace (Direct and Indirect).
- s) Observation of Temperature, distribution of Muffle Furnace and heating methods for various jobs. Practice by using Rock well Hardness Tester. Identification of steel. By Spark test and sound test.
- t) Effect of different Quenching Medias on Henders steel, Brine cold water, oil, air and Warm water. Annealing, Normalizing, Hardening and Tempering operations by using Electrical oil Fired Furnace.
- u) Forge Butt welding practice on thicker section, welding practice on Low and High carbon steel bar.
- v) Forging and Eye-Bolt. Forging a Crane Hook. Forging spanners. Forging Carpentry Tools. (Firmer Chisel-Mortise chisel claw Hammer).
- w) Forming of Lathe Tools. a. Screw cutting tool. b. Parting tool. c. Boring tool. d. From tool.
- x) Hardening and tempering of-high speed steel and aprong steel. Heat treatment of stainless steel. Forging an Adze by Forge welding, Grinding and Heat treatment.

4. I.T. Literacy

- a) **Basics of Computer:** Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.
- b) **Computer Operating System :** Basics of Operating System, WINDOWS, The user interface of

Windows OS, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc, Use of Common applications.

- c) **Word processing and Worksheet** : Basic operating of Word Processing, Creating, opening and closing Documents, use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Tables. Printing document. Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets
- d) **Computer Networking and INTERNET** : Basic of computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks), 22 Meaning of World Wide Web (WWW), Web Browser, Web Site, Web page and Search Engines. Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication. Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT - ACT, types of cyber crimes.

5. Occupational Safety, Health & Environment Education

- a) **Safety & Health**: Introduction to Occupational Safety and Health importance of safety and health at workplace.
- b) **Occupational Hazards**: Basic Hazards, Chemical Hazards, Vibro-acoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention.
- c) **Accident & safety** : Basic principles for protective equipment. Accident Prevention techniques - control of accidents and safety measures.
- d) **First Aid** : Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person.
- e) **Basic Provisions**: Idea of basic provision of safety, health, welfare under legislation of India.
- f) **Ecosystem**: Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance.
- g) **Pollution**: Pollution and pollutants including liquid, gaseous, solid and hazardous waste.
- h) **Energy Conservation**: Conservation of Energy, re-use and recycle.
- i) **Global warming**: Global warming, climate change and Ozone layer depletion.
- j) **Ground Water** : Hydrological cycle, ground and surface water, Conservation and Harvesting of water.
- k) **Environment** : Right attitude towards environment, Maintenance of in -house environment.

Note: The above syllabus is indicative and the questions in the test may include similar other topics pertaining to the level and content of essential qualification.