

**Detailed Syllabus for the post of JUNIOR INSTRUCTOR (DRAFTSMAN
MECHANIC) (Industrial Training) - Direct Recruitment**

(Cat.No: 007/2022)

MODULE 1

ENGINEERING DRAWING

15 marks

Basic drawing instruments, Size of drawing sheets, Layouts of drawing sheet – Title Blocks
Types of lines

Dimensioning – need for dimensioning, methods of dimensioning, elements of dimensioning
Meaning of drawing to scale –representative fraction - reduced scale, enlarged scale, full size
scale, types of Scale –plain scales, diagonal scales, Vernier scales, isometric scale

Geometrical construction - polygons- Conic sections – ellipse, parabola, hyperbola

Miscellaneous curves- involute, helix, cycloid

Projection of points in all quadrants – projection of lines in first and third quadrant –
projection of planes in first quadrant

Orthographic view – importance – front, top and side view – concept of first angle and third
angle projection – sectional views – concept – importance – types of sectional views-
Auxiliary view – Isometric view – Isometric projection –cavallier projection – cabinet
projection

Development of surfaces- importance- application – methods- concept of development of
simple engineering objects

MODULE 2

MACHINE DRAWING

15 marks

Screw Threads. Thread terminology– Forms of screw threads (Square thread, V thread) – Whitworth
thread– British Association thread–American standard thread–Acme thread–ISO -Metric thread–
square thread–single start and multi start threads–right hand and left hand Threads–conventional
representation of threads. Bolted connection using standard Proportions.

Basic Fastening Devices. Temporary and permanent fasteners – areas of applications – Nuts and Bolts– Bolts with special forms of heads–Stud bolts-Screws– different types of locking arrangements of nuts.

Riveted joints. Different types of rivet heads for general purposes–proportions of riveted joints- Different types of riveted joints – single riveted and double riveted lap joint (Chain and zigzag), single riveted single strap butt joint and single riveted double strap butt joint.

Foundation bolts. Common types, Special types

Need and functions of assembly and detailed drawings-Steps in preparing Assembly and Detailed drawings of joints like Sleeve and Cotter Joint, Socket and Spigot Joint, Knuckle Joint, Gib and Cotter joints -Coupling such as Flanged coupling – (Protected type, unprotected type and bush type)

Classification of bearings-Types of journal and thrust bearings-Bearing brasses and their support- Prevention of rotation of brasses

Classification of welds- Elementary welding symbols. Types of pipes – Methods of connecting pipes- pipe threads-Representation of pipe threads- Single and double line Orthographic symbols for pipe fittings and valves (flanged, screwed and welded joints)-Piping layout

MODULE 3

PRODUCTION DRAWING

10 marks

Need of preparing a production drawing - components of a production drawing - Limits, Fits and Tolerances -Definition of limits, fits and tolerances. Geometrical tolerance - Characteristics of geometrical tolerance – Dimensional tolerance – Systems of fits-problems relating Hole basis and Shaft basis system and schematic diagrams- Select dimensions from B. I. S. Tables to obtain clearance-transition and interference fit for a given set of mating parts.

Surface Roughness -Surface roughness terminology- surface roughness values, Grades and symbols. Symbols indicating surface texture – Relation between surface finish and manufacturing processes- Symbols representing direction of lay.

Interpretation of Drawings- identifying the type of production-extracting important functional dimensions-checking the number of parts in an assembly. Checking and listing missing dimensions- Identifying the sectional views. Need and details of Shop floor drawing

Process charts Different types-Understand various machining processes-Calculation of weight per piece-Preparation of Operation Chart.

MODULE 4
COMPUTER AIDED DESIGN AND DRAFTING
15 MARKS

History – application – Advantages over manual drafting –Hard ware requirements – Soft ware requirements – Different software used for CAD

Basic elements of AUTOCAD - Draw and modifying commands: setting commands - limits of drawing, units, grid, snap– absolute coordinate system-relative coordinate system-polar coordinate system-direct distance entry system.

Drawing and Modifying commands used in CAD- Working with CAD: Properties of lines – colour, line weight, line type, layer properties - Hatch and gradients, dimensions and text on drawings - Developing simple orthographic views and dimensions with text - Developing detailed orthographic views with all features- Joints, bearings, machine parts-Isometric drawing- Isometric snap and grid, Pictorial drawing- Isometric views of simple objects - Shop floor drawing of various machine parts- Layers- block – filter

3D modelling- UCS-surface modelling – solid modelling- Boolean operations- 3D operations- rendering- Viewports- camera – Introduction to Pro E, Catia, Solidworks

MODULE 5
MANUFACTURING PROCESS

10 marks

Foundry -Types of patterns- Types of moulding – Pouring and feeding- pouring techniques –casting- types of casting – cold working techniques- hot working techniques

Welding – Tools used -types of welding- - welding positions- defects in weld - Arc Welding – Equipment, Principle of arc welding- arc welding machines – D.C. generators- A.C. transformers- Gas welding -Shielded metal arc welding-Submerged arc welding-TIG -MIG welding-Resistance welding - Spot welding, Seam welding, Projection welding- Thermit welding-atomic hydrogen welding-Welding electrodes- welding joints

Tools and instruments used in carpentry- sheet metal – fitting

Press working: Types of presses and Specifications, Press working operations - Cutting, bending, drawing, punching, blanking, notching, lancing; Die set components- press tool

Forging processes- classification of forging processes-flat die forging and closed die forging –Forging Tools- anvil- swage block- hammers - tongs- chisels- swages- fullers- flatters- set hammer- punch and drift

MODULE 6

MACHINE TOOLS

10 marks

Lathe machine and operations: Type of lathe – Centre lathe- Tool room lathe- Bench lathe -Speed lathe. Lathe construction – lathe parts- function of each part - Lathe accessories –Work holding and tool holding devices.

Drilling: Classification; Basic parts and their functions; Radial drilling machine; Types of operations; Specifications of drilling machine; Types of drills and reamers. -Shaping Machines- shaper-use – parts and their functions – shaper tool holding devices-Quick return motion - arrangements and adjustments of stroke- crank and slotted lever method -Whitworths method- Hydraulic method- automatic feed mechanism- speed, feed and depth of cut –Shaper specification

Milling: Introduction; Types of milling machines and parts only: plain, Universal, vertical; specifications; Up milling and Down milling; Milling operations;-Milling cutters – types; Nomenclature of teeth; Teeth materials; Tool signature of milling cutter; Tool & work holding devices. NC &CNC Machines-Basic concepts of NC and CNC machines-Introduction- construction details – classification

Jigs – importance- types- design considerations- applications – fixtures for turning, milling, drilling and grinding

MODULE 7

MATERIAL SCIENCE, METROLOGY, PLANT LAYOUT & SAFETY

10 marks

Crystal structures: Unit cell and space lattice: Crystal systems. Crystal structure for metallic Elements: BCC, FCC and HCP – Iron carbon diagram – TTT diagram

Measuring Gauges and Comparators: Gauges: plain plug gauge, ring Gauge, snap gauge, feeler gauge, thread pitch gauge, limit gauge (GO-NOGO); Comparators: Characteristics of comparators, Types of

comparators- Linear and Angular Measurement: Concept; Instruments for linear and angular measurements; Working and Use of precision and non-precision measuring instruments-Dial Gauge-Slip gauge, Vernier depth gauge, Universal Bevel Protractor-Clinometer, Sine Bar, Spirit Level

Plant layout; Types; Process; Product, Fixed position, Combination layout; Principles of Material handling equipment; Types of material handling equipment- Relation of plant layout with material handling

Importance of safety in work place -increasing trends in industrial accidents -terminology -factory -accident -incident -severity rate -- frequency rate -incidence rate -safety performance index -accident proneness -unsafe acts - causes of accidents: - Mechanical, Environmental, personnel factors -accident prevention techniques --organizing safety -role of management -safety officers -government norms

MODULE 8

AUTOMOBILE ENGINEERING

5 MARKS

IC Engines-classification - parts-Different systems of I C engines- Fuel system of petrol engine -components - A C mechanical pump -carburetion - functions of carburettor - -Solex carburettor -fuel systems of diesel engine -fuel filter - working of Diesel pump -injectors -Coil ignition and magneto ignition system- Cooling system and classification- air cooling and water cooling systems

Transmission systems in automobile - working - clutch functions - requirements of clutch -single plate - multi plate - diaphragm - automatic and centrifugal clutch-Fluid coupling. - Gear box – functions-working- types- sliding mesh - constant mesh - synchromesh — epicycle gear box - torque converter over drive-Propeller shaft - universal joint - C V joint - final drive –differential

Steering wheel - steering column - Steering gears - point steering - steering geometry - camber -caster -king pin inclination - toe in and toe out-Understand wheels & tyres .Types of wheels - size of wheel – ply-rating

MODULE 9

Pipe fittings & Machine Elements

5 MARKS

Classification of followers and cams - cam terminology- Cam Profile – Functions of the governors - types of governors- flywheels – comparison

Types of belts - flat belt, circular belt or rope, V-belt - types of flat belt drives - open and crossed belt drive - compound belt drive - stepped or cone pulley drive - velocity ratio - slip – creep

Functions of gears - friction wheels - advantages and disadvantages of a gear drive- types of gear- spur gear nomenclature- types of gear train

Identify the various types of pipe fittings, joints and valves- Pumps – classification – reciprocating pump- function - slip – air vessel- Centrifugal pump – parts – types of casing

Hydraulic power systems- components – control valves- actuators- symbols for components of hydraulic system – pneumatic system – components- control valves- actuators – symbols for pneumatic components

Module 10

Pressure Vessels and power plants

5 marks

Steam boilers- Classification - fire tube and water tube Boiler-La-Mont boiler & Cochran boiler- comparison between water tube & fire tube boiler- Boiler mountings - Stop valve-Safety valve-Water level indicator-Pressure gauge-Fusible plug-Boiler accessories - Feed pump-Economizer-Super heater-Air preheater

Steam Turbines- principle- working – types – impulse- reaction

Classification of power plants- Working and components of power plant -Steam power plant- Hydroelectric power plant - Diesel power plant -Nuclear power plant

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