

GROUP-07

Draughtsman (Mechanical)- LEVEL- Matric+ Dip. in Draughtsman (Mech.)

1) General awareness, Reasoning, Mathematics, Science, History including Haryana related history, current affairs, literature, Geography, Civics, Environment, Culture etc.-

(Weightage 20%)

2) Computer terminology, Fundamentals, word software, excel software, Power point, internet, web browsing, Communication, emails, downloading and uploading data on websites etc.-

(Weightage 10%)

3) Subject related syllabus-

(Weightage 70%)

Professional Skill

Soft Skills: its importance and Job area after completion of training. Introduction of First aid. Operation of electrical mains. Introduction of PPEs. Introduction to 5S concept & its application. Response to emergencies e.g., power failure, fire, and system failure, Nomenclature, description and use of drawing instruments & various equipment used in drawing office. Their care and maintenance Lay out and designation of a drawing sheet as per Sp -46: 2003 Recommended scale of engineering drawing as per Sp -46: 2003 Types of Lines and their application. Folding of prints for filing Cabinets or binding as per SP: 46-2003, Type of lettering proportion and spacing of letters and words, Definition of ellipse, parabola, hyperbola, different methods of their construction. Definition & method of drawing involutes cycloid curves, helix & spiral, Terminology – feature, functional feature, functional dimension, datum dimension, principles. Units of dimensioning, System of dimensioning, Method of dimensioning & common features, Methods of obtaining orthographic view. Position of the object, selection of the views, three views of drawing. Planes and their normal projections, Orthographic projection. First angle and third angle projection. Principal of orthographic projection. Projection of solids like prism, cones, pyramids and their frustums, Methods of free hand sketching for machine parts, Knowledge of different types of scales, scale of cords, their appropriate uses, Principle of R.F, diagonal & vernier, Knowledge of solid section. Types of sectional views & their uses. Cutting plane and its representation. Parts not shown in section. Conventional signs, symbols, abbreviations & hatching for different materials. Solution of problems to find out the true shape of surfaces when solids are cut by different cutting planes, Definition of development, its need in industry & different method of developing the surfaces. Development of surfaces bounded by plane of revolution intersecting each other. Development of an oblique cone with elliptical base etc., Calculation of developed lengths of geometrical solids, Definition of Intersection & interpenetration curves. Common method to find out the curve of interpenetration. Solution of problems on interpenetration of prism, cones, & pyramids with their axes intersecting at an angle. Intersection of cylinder, Principle of isometric projection and Isometric drawing. Methods of isometric projection and dimensioning. Isometric scale. Difference between Isometric drawing & Isometric projection, Principles of making orthographic views from isometric drawing. Selection of views for construction of orthographic drawings for clear description of the object, Principle and types of oblique projection. Advantage of oblique projection over isometric. Projection,

Different types of fasteners, welds and locking devices

Screw threads, terms nomenclature, types of screw thread, proportion and their uses, threads as per SP46:2003 conventions. Types of bolts, nuts and studs, and their proportion, uses. Different types of locking devices. Different types of machine screws, cap screws, set screws as per specification. Different types of foundation bolts and their uses, Description of Welded Joints and their representation (Actual and Symbolic) Indication of Welding Symbol on drawing as per SP-46, Different types of keys (Heavy duty and Light duty) cotters, splined shaft, pins and circlips. Calculation of sizes and proportions of keys, Pipe Joints: selection of materials as per carrying fluid and conditions. Description of different pipe joints fitted on pipe. Expansion joint, loop and other pipe fittings, Types of rivets, their size proportions and uses. Types of riveted joints, terms and proportions of riveted joints. Conventional representation. Relation between rivet size and thickness of plates and calculation for arrangement of rivets position. Causes of failure of riveted joint efficiency of riveted joints.

Tools and equipment and their application in Allied trades

Description and application of simple measuring tools. Description of vices, hammers, cold chisel, files, drills, etc.- proper method of using them. Method of using precision measuring instrument. Maintaining

sequence of operation in fitting shop and safety precaution, Safety precaution for lathes, Description of parts of Lathe & its accessories. Method of using precision measuring instrument such as inside & outside micrometres, depth gauges, vernier callipers, dial indicators, slip gauges, sine bars, universal bevel protractor, etc., Brief Description of milling, shaping, slotting and planning machines. Quick return mechanism of these machines. Maintaining sequence of operation in machine shop and safety precaution, Brief description of common equipment required for sheet metal work. Different types of joints used in sheet metal work, Maintaining sequence of operation in machine shop and safety precaution. Brief description of the hand tools used gas & arc welding. Different types of welded joints and necessary preparation required for these. Safety precautions, Hand tools used for molding. The description, use and care of Safety precaution maintained in electrician shop. A.C & D.C Motors Generators of common types and their uses and brief description of common equipment necessary for sheet metal work. Electrical units and quantities. Laws of electricity. Simple examples of calculation of current voltage, resistance in series and parallel connection (D.C. Circuit). Brief description of internal combustion engines, such as cylinder block piston, carburettor spark plug, camshaft, crank shaft, injector fuel pump etc.,

Different types of gears, couplings and bearings with tolerance dimension and indicating surface finish symbol

Limits, fit, tolerance. Tolerance dimensioning, geometrical tolerance. Indications of symbols for machining and surface finishes on drawing (grades and micron values) Production of interchangeable parts, geometrical tolerance. Familiarization with IS: 919, IS:2709, Couplings, necessity of coupling, classification of couplings. Uses and proportion of different types of couplings. Materials used for couplings, Knowledge of bearing to reduce friction, types of bearing, frictional and anti-frictional bearings. Material used for frictional bearings. Properties of frictional bearing (sliding bearing) materials. Parts of anti-frictional bearings (ball, roller, thrust ball, needle & taper roller). Materials and proportion of parts. Difference between frictional and anti-frictional bearings. Advantages of anti-frictional bearings, Gears and gear drives- uses, types, nomenclature and tooth profiles.

Computer Application in Drawings

Introduction to computer, Windows operating system, file management system. Computer hardware and software specification. Knowledge of installation of application software, Introduction to CAD Advantages of using CAD, CAD main Menu, screen menu, command line, model space, layout space. Drawing layouts, Tool bars, File creation, Save, Open existing drawings, creation of Drawing Sheet as per ISO, Absolute Co-ordinate system, Polar Co-ordinate System and Relative Co-ordinate System Create Line, Break, Erase, Undo.

WORKSHOP CALCULATION & SCIENCE:

Unit, Fractions Classification of unit system Fundamental and Derived units F.P.S, C.G.S, M.K.S and SI units Measurement units and conversion Factors, HCF, LCM and problems Fractions - Addition, subtraction, multiplication & division Decimal fractions - Addition, subtraction, multiplication & division Solving problems by using calculator Square root, Ratio and Proportions, Percentage Square and square root Simple problems using calculator Applications of Pythagoras theorem and related problems Ratio and proportion Ratio and proportion - Direct and indirect proportions Percentage - Changing percentage to decimal and fraction, Material Science: Types metals, types of ferrous and nonferrous metals Physical and mechanical properties of metals Introduction of iron and cast iron Difference between iron & steel, alloy steel and carbon steel Properties and uses of rubber, timber and insulating materials Mass, Weight, Volume and Density Mass, volume, density, weight and specific gravity Heat & Temperature and Pressure Concept of heat and temperature, effects of heat, difference between heat and temperature, boiling point & melting point of different metals and non-metals Mensuration Area and perimeter of square, rectangle and parallelogram Area and perimeter of Triangles Area and perimeter of circle, semi-circle, circular ring, sector of circle, hexagon and ellipse Surface area and volume of solids - cube, cuboid, cylinder, sphere and hollow cylinder Finding the lateral surface area, total surface area and capacity in litres of hexagonal, conical and cylindrical shaped vessels Trigonometry Measurement of angles Trigonometrical ratios Trigonometrical tables. Centre of Gravity Centre of gravity - Centre of gravity and its practical application Area of cut out regular surfaces and area of irregular surfaces Area of cut out regular surfaces - circle, segment and sector of circle Related problems of area of cut out regular surfaces - circle, segment and sector of circle Area of irregular surfaces and application related to shop problems

Estimation and Costing Estimation and costing - Simple estimation of the requirement of material etc., as applicable to the trade Estimation and costing - Problems on estimation and costing.

Projection views of geometrical figures with dimension and annotation on CAD

Drawing of Line, polyline, ray, polygon, circle, rectangle, arc, ellipse using different options, Trim, Offset, Fillet, Chamfer, Arc and Circle under modify commands. Move, Copy, Array, Insert Block, Make Block, Scale, Rotate, Hatch Commands, creating templates, inserting drawings, Layers, Modify Layers, Format dimension style, creating new dimension style, Modifying styles in dimensioning. Writing text on dimension line and on leader, Edit text dimension, Knowledge of shortcut keyboard command. Customization of keyboard command. Customization of drafting, settings, changing orthographic snap to isometric snap. Procedure to create viewport in layout space in zooming scale.

Machine parts viz., Pulleys, Pipe fittings, Gears and Cams

Belt-drive. Materials of belts, slip and creep, Velocity of belt. Arc of contact. Simple exercise in calculation of belt speeds, nos. of belts needed in V-belt drive, velocity, pulley ratio etc. Standard pulleys width of pulley face, velocity ratio chain drive, Knowledge of different pipe materials and specifications of Steel, W.I. & PVC pipes. Brief description of different types of pipe joints. Pipe threads. Pipe fittings (threaded, welded and pressed). Specifications of pipe fittings. Different types of valves, Gear drive- Different types of gears. Cast gears and machined gears. Knowledge of profile of gears etc., Use of Cams in industry. Types of cams, kinds of motion in cam, displacement diagrams. Terms used in cam. Types of followers.

Engine parts with detailed and assembly in template layout

Knowledge of engine mechanism. Transmission of motion from reciprocating to circular through eccentric, crank and connecting rod, Knowledge of fuel injection system in petrol and diesel engine, Introduction to 3D modelling, 3D primitives (viz. box, sphere, cylinder, mesh and poly-solids), solid figure by extrude, revolve, sweep and loft command, solid editing: fillet, offset, taper, shell and slice command. Setting of User co-ordinate Systems, Rotating, Print preview and Plotting.

Tools & Mechanical systems

Working principle of valves and their description, Knowledge of simple stationary fire tube boiler, boiler mountings. Function and purpose of blow off cock, Brief description of a typical hydraulic system, components, working principle and function of hydraulic jack. Different types of hydraulic actuator. Symbol and working of hydraulic DC valve, non-return valve and throttle valve, Knowledge of typical pneumatic system, FRL or air service unit and pneumatic actuator, Different types of pump systems. Characteristics of a pump system: pressure, friction and flow. Energy and head in pump systems, Different clamping devices on lathe, Description of different job holding devices in lathe operation, Different clamping devices on milling operation, Different clamping devices on shaping operation, Knowledge of accuracy and interchangeability in the manufacturing of products, Knowledge of various parts of press tools and their function, Knowledge of different moulding processes. Introduction to Die casting, gating system design, force calculation, defects and remedies and estimation, Description of different parts of petrol engine, Knowledge of design, manufacture, and operation of pressure vessels, Proper measurement practice in workshop. Principles of good measurement result: right measurement, right tools, right sketching, review and right procedures, Lay out of Machine foundations. Brief treatment of the principle Involved and the precautions to be observed. Lay out of machine Foundation. Consideration of ergonomics (human factor) for shop layout.

Solid Works/AutoCAD Inventor/ 3D Modelling:

Introduction to Solid Works/ AutoCAD Inventor/ 3D Modelling User interface - Menu Bar – Command manager – Feature manager – Design Tree – settings on the Default options – suggested settings – key board short cuts. Create the best profile – create a sketch – create a new part, extrude bosses and cuts, add fillets, and chamfer changing dimensions. Revolved features using axes, circular patterning changes and Rebuild problems, bottom-up assembly modelling Components configuration in an assembly, insert subassemblies, Interference detection, Drawings & Detailing, create drawing sheets, add drawing items, Named views, std. 3 views, auxiliary views, section views, detail views. Drawings & Detailing, create drawing sheets, add drawing items, Named views, standard 3 views, auxiliary views, section views, detail views, Difference between sweep and loft. Exploded views – Configuration manager, Animation

controller. Annotating Holes and Threads, Creating Centrelines, symbols and leaders, Simulation. Introduction to plot & Different ways of plotting, Knowledge of production drawing, name plate and bill of materials, etc. Study of production drawing. Procedure of preparing Revision Drawing: putting revision mark, writing remarks in the table as per check list.

Important Note: The Weightage as mentioned against the syllabus is tentative & may vary.