(iv)TRADE : MECHANICAL

PAPER-I **LATHE MACHINE AND OPERATIONS**

THEORY

Time : 2 Hrs

Theory : 30 Marks
CCE : 10 Marks
Practical : 50 Marks
Total : 90Marks

Introduction to Basics

Simple Sketches of Mechanical Hand Tools, Brief Description of Machine Tools and Equipments, Different Types of Operations by Different Types of Machine Tools (Only Name and Diagrams), Safety Precautions In Using Machine Tools.

Introduction to Lathe

Lathe, Centre Lathe, General Purpose Lathe Machine, Types, Specification, Safety Rules of the Workshop. Principle of Lathe.

Lathe Machine Parts

Study of Various Lathe Parts and Sub Assemblies of Lathe & their Functions, Description and Sketches of Accessories - Lathe Centers, Face Plate, Dressing Plate, Angle Plate, Three Jaw Chuck, Four Jaw Chuck, Collet Chuck, Mandrel, Steady Rest, Moving Rest, Tail Stock, Taper Turning Attachments.

Cutting Tools

Cutting Tools Geometry of Single Point Cutting Tool, Various Angles and their Values for Cutting Different Metal Jobs, Classification of Cutting Tools, Special Purpose Tools

- Facing Tool, Parting off Tool, Threading Tool, Boring Tool, Knurling Tool, Tool Material - Classification, Composition, Properties and Applications of High Carbon Steel, High Speed Steel, Carbide, Ceramic and Diamond.

Lathe Machine Terminology

Taper, Taper Turning, uses of Taper, Explanation of Taper, Calculations for Taper, Conicity - Speed, Feed, Depth of Cut.

Lathe Operations:

Centering, Simple Turning, Step Turning, Facing, Drilling, Boring, Tapering, Knurling, Parting off, Taper Turning , Chamfering, Finishing.

Calculations for Thread Cutting

Explanation of Simple Gear Train and Compound Gear Train, Calculation for Change of Wheels for Metrics Thread on English Lead Screw, Cutting Multiple Threads, Brief Description with Dies, Feed Gear Box.

CNC Machine

Introduction, Applications, Uses, Advantages and Disadvantages

LATHE MACHINE AND OPERATIONS

Time: 3 Hrs **PRACTICAL** **Marks : 50**

- Holding of job in four jaw chuck, centering with the help of check method, scriber and cutting tool.
- Setting the tool in tool post, plain turning, facing and parting off on M.S rod as per dimensions given by teacher .
- Step turning on M.S. Bar as per dimensions given by teacher.
- Grinding of single point cutting tool according to specific geometry.
- Taper turning and knurling and chamfering, threading.
- Drilling and Boring.
- Dismantling and assembling of different accessories and care & maintenance of lathe machine.

PAPER-II **ENGINEERING MATERIAL**

THEORY

Time : 2 Hrs

Theory : 30 Marks
CCE : 10 Marks
Practical : 50 Marks
Total : 90Marks

Introduction

Materials Classification - Metals, Ferrous and Non Ferrous, Metals and Non Metals, Different Non - Metals, Plastic, Rubber and Wood.

Properties of Materials

Physical and Mechanical Properties, Physical Properties - Colour, Weight etc, Mechanical Properties - Strength, Elasticity, Plasticity, Ductility , Brittleness, Malleability, Hardness, Toughness, Technological Properties - Machinability, Formability, Weldability, Measurement of Hardness - Brinell and Rockwell.

Ferrous Metals

Mineral Ores, Different types of Ores, Metallurgical Definitions, Description of Pig Iron, Process, Working of Blast Furnace, Types of Cast Iron, Wrought Iron - Composition, Properties and uses, Steel - Composition, Properties and uses.

Steel and Alloy steel

Introduction, Composition of MS in %age of Properties, Uses of Steel, Manufacturing of Carbon Steel, Basic Constituents of Steel, Composition, Properties and Uses of Special Alloy Steel - Chromium, Nickel, Stainless Steel, High Carbon Steel, High Speed Steel, Molybdenum, Tungsten and Vanadium Steel.

Mechanical Working of Metals

Introduction, Mechanical Working (Process), Hot Working, Principle Methods of Hot Working - Rolling (Hot and Cold), Drawing, Extracting and Forging (only Drop Forging).

Sheet Metals and Pipe Fittings

Introduction, types of Sheets, Thickness of Sheet Metals – in MM, Gauge No. Uses of Sheet Metal, Layout of Sheet Metals, 4 No.S- Pipe Fittings (only Description).

Solar Gadgets

Working Principles, Introduction, Types and Uses of - Solar Cookers, Solar Water Heaters, Solar Photovoltaic Panels and Solar Dryers etc, Components of Solar Cookers - Reflector, Boxes, Insulation, Adjustment/ Orientation/ Alignment of Solar Gadgets for Efficient Uses, Common Faults and Corrective Measures, Safety and Precautions in use of Solar Gadgets.

Biogas Plant and Appliances

Working Principles, Commonly used Substance for Biogas Production, Introduction - KVIC, Fixed Dome Type Bio Gas Plants, Appliances - Burners, Lantern, Engines and Uses, Main Components of Biogas Plants - Digester, Inlet, Outlet, Gas Holder/ Dome

and their Functions, Gas Conveyance Pipe Lines and Water Draining Devices, Installation and Commissioning of Biogas Plants and Appliances, Repair and Routine Maintenance of Biogas Plants.

Non Ferrous Metals and Alloys

Introduction, Properties and Uses of Copper and Aluminium.

Other Important Engg. Materials

Rubber, Plastic, Properties and Application of Thermoplastic and Thermo Setting Plastic, Applications of Rubber, Ceramics, Wood.

Quality Concept

Definition of Term "Quality", Introduction to Quality Standards according to BIS - ISO 14000 and ISO-9000.

ENGINEEING MATTERIAL

Time: 3 Hrs **PRACTICAL** **Marks : 50**

- To identify and distinguish between different engineering materials based on observations, physical properties - Make a write up.
- To distinguish between mild steel, cast iron and high speed steel by spark pattern test on a grinder.
- To make a funnel and weld/ solder its joint.
- Practice on cutting of pipes and make joint of two pipes by socket.
- At least two visits to selected industry to give the practical, exposure to students.
- Familiarization and identification of different parts of components of commonly available solar cooker, solar water heater, solar photovoltaic and solar dryers, function of different parts and adjustment for their efficient use.
- Familiarization and identification of different components of biogas plants and appliances, function of different parts, routine repair and maintenance of biogas appliances.

PAPER-III **MECHANICAL DRAWING - I**

THEORY

Time : 2 Hrs

Theory : 30 Marks
CCE : 10 Marks
Practical : 50 Marks
Total : 90Marks

Mechanical Drawing & Engg. Drawing

Introduction , Artistic and Engg. Drawing, Civil, Electrical, Mechanical Engg. Drawing.

Geometrical Drawing

Introduction, Plane and Solid Geometrical Drawing.

Drawing Instruments

Drawing and Uses of Engg. Drawing Instruments.

Title Block

Meaning and Details, Maintenance of Drawing Sheet.

Geometrical Construction

Point, Straight Line, Angle, Acute Angle, Right Angle, Obtuse Angle, Straight Line Angle, Complete Angle, Reflect Angle.

Plain Figure

Circle , Arc, Chord, Centre, Diameter, Radius, Tangent Line, Segment, Sector.

Triangle

Introduction, types of Triangles - Scalene, Equilateral, Isosceles, Acute, Obtuse, Right Angled Triangle.

Quadrilaterals

Introduction, Square, Rectangle, Rhombus, Parallelogram, Trapezium, Difference between Square and Rhombus.

Solid Geometry

Introduction, Types - Prism, Pyramid, Cube, Cylinder, Cone, Sphere.

Polygons

Pentagon Figure / Construction, Hexagonal, Octagonal.

Lines, Lettering and Dimensions

Introduction, Definition, Types, Uses and Important Rules.

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MECHANICAL DRAWING - I

Time: 3 Hrs **PRACTICAL** **Marks : 50**

Geometrical Constructions

- Introduction, definition of points, lines, angles.
- Size of sheet and layout of sheet, Standard sizes of drawing sheets, margin, title block etc.
- Review of geometrical constructions - dimensions of straight line and angle, triangle, quadrilateral, polygon, circles.
- Draw parallel lines, perpendiculars, different patterns, tangents.

Lines, Lettering, Dimensions and Conventions

- Lines, materials, solids, breaks, conventional representation used in engineering.
- Standard practice for writing single stroke and double stroke in 7:4. (Note - metal stage graph paper may be used after some practice, student should be able to draw graph).
- Standard practice for numerals ,dimensioning.

Scales

- Representative factor, simple, reduced & enlarged scale, plane and diagonal scale.

Free Hand Sketching

- Lines, circles, squares, rectangles, areas and curves.
- Diagram of solids - round, cube, rectangular block, cylindrical block, cone, prism, hexagonal etc.
- Free hand sketch of locking devices - washer, spring washer, keys etc.

Orthographic Projections

- Concept of projections, first angle and third angle projections, simple examples of orthographic projections of point, line & planes where the lines are parallel to one of the plane.
- Sketching orthographic views from pictorial views, orthographic projections of simple figures.
- Orthographic projections of nut & bolt (square as well as hexagonal).