

Time : 2 Hrs

Theory : 30 Marks

InA : 10 Marks

Practical : 50 Marks

Total : 90Marks

## **FITTING**

### **Hand Tools**

Hammers, Pliers, Spanners, Torque & Other Wrenches, Punches, Files, Taps and Dies, Screw Drivers, Hacksaw, Try Squares, Marking Tools, V-Block, Surface Plate, Scriber, Steel Scale, Marking Gauge etc.

### **Mechanical Measurements**

Linear Measuring Instruments, Calipers, Vernier Caliper, Micrometer, Depth and Height Gauge, Angular Measuring Instruments, Bevel Protector, Combination Set Gauge, Feeler Gauge, Wire Gauge, Thread Gauge, Radius Gauge, Dial Gauge.

### **Limits, Fits and Tolerances**

Need for Limit Systems, Types of Fits - Clearance Fits, Transition Fits, Interference Fits, Elaborating of the above with Examples, Limit Gauges and their Applications, Limits and Tolerances, Correlation of Allowance with the Type of Fit.

## **WELDING**

### **Principles and Application**

Principles, Applications of Welding, Brazing and Soldering, Classification of Welding.

### **Oxy-Acetylene Welding**

Principle of Gas Welding, Gas Welding Equipment, Low Pressure and High Pressure Gas Welding, Flame - Parts of Flame, Types of Flames and uses, Gas Cutting, Fluxes - Composition and Application.

### **Electric Arc Welding**

Introduction, Principle of Arc Welding, Arc Welding Equipment, Types of Welding Joints, Edge Preparation, Types of Electrodes and their Uses, Flux Properties and uses., Arc Welding Methods using AC and DC supply.

### **Special Welding Techniques**

Electric Resistance Welding- Principle, Description and Working, MIG/MAG welding.

## **FITTING AND WELDING**

Time: 3 Hrs

PRACTICAL

Marks : 50

- Cutting, chipping, filing and use of measuring instruments.
- Prepare M.S. Rectangular flat with use of file.
- Fitting of male and female pieces.
- Make cube/ rectangular solids from round bar/ stock.
- Drilling, Reaming, Tapping and Spot Facing operations.
- Production of different flames for welding & cutting with Oxy -Acetylene welding equipment and accessories.
- Make a lap joint by arc welding.
- Make a butt joint by arc welding.
- Make a T Joint by arc welding.
- Make a sheet metal funnel and soldering of joints with a soldering iron.
- Repair of sheet metal stool or bench by gas welding/ arc welding.
- Repair of an article by gas as well as arc welding.

## **TRADE : MECHANICAL**

### **12<sup>th</sup> VOCATIONAL**

#### **PAPER-II**

#### **MACHINE TOOL OPERATION**

##### **THEORY**

**Time : 2 Hrs**

**Theory : 30 Marks**

**InA : 10 Marks**

**Practical : 50 Marks**

**Total : 90 Marks**

### **Drilling Machine**

Classification, Specification and General Description of Drilling Machines, Types of Operations - Spot Facing, Counter Boring, Counter Sinking, Tapping and Reaming, Types of Drills, Tap and Reamers.

### **Milling Machines**

Types, Construction and Specifications of Milling Machines, Types of Milling Cutters, Profile - Job, Tool Holding Devices, Methods of Indexing - Simple, Compound, Differential and Angular Indexing, Milling Operations - Face Milling, Gang Milling, Spiral Milling, Gear Milling, Cutting Speed and Feed, Selection of Milling Cutters.

#### **Power Hacksaw Machine**

Description, Working of Machine, Selection of Blades for Cutting Different Materials.

### **Grinding Machines**

Types of Grinding Operations - Cylindrical, Internal and External Surface Grinding, Magnetic and Self Centering Chucks, Types, Shape and Selection of Grinding Wheels, Grinding Wheels Balancing and Dressing, Use of Universal Tool and Cutter Grinder.

### **Lubricants**

Necessity of Lubrication, Types of Lubricants - Solid, Semi - Solid, Liquid Lubricants, Properties of a Good Lubricant, Designation of Lubricating Oils according to BIS, Application of Different Grades of Lubricating Oils With Examples, Coolants and Cutting Fluids.

## **Transmission of Power**

Concept of Power Transmission, Types of Drives - Belt and Gear Drives, Types of Belt Drives, Classification of Gear Trains, Simple and Compound Gear Trains, Velocity Ratio, Calculation of Driver and Driven Speeds Gear Ratio, Angular and Peripheral Speed, Power.

## **Engine**

Constructional Features of I.C. Engines and familiarization with Principle Parts, Principles of Operation and Salient Features of Four Stroke and Two Stroke Engines. **Simple Machines**  
Definition of Terms - Load, Effort, Velocity Ratio (V.R.), Mechanical Advantage (M.A.), Mechanical Efficiency, Types of Levers, Pulleys, Fixed and Movable Pulleys, Simple Machines - Simple Wheel and Axle, Simple Screw Jack, Worm and Worm Wheel, Single Purchase Crab, Industrial Applications of the above Machines.

## **Machine Shop Layout & Maintenance of Machines**

Layout of Machine Shop, Maintenance of Different Types of Machines, General Instructions for Machine-Shop, Purpose and Importance of Maintenance, Reconditioning and Overhauling of Machines.

### **MACHINE TOOL OPERATION**

**Time: 3 Hrs**

**PRACTICAL**

**Marks : 50**

- Drilling countersinking on drilling machine.
- To perform Face milling.
- To perform Form milling.
- Grinding of twist drills.
- Drilling, Boring and Reaming on drilling machine.
- Prepare a sheet metal according to given drawing.
- Familiarization with various machine tools and machines used in maintenance & repair of tractors.
- Familiarization with different components, gauges & controls of tractors.
- General cleaning, oiling & greasing of tractors.
- Checking & tightening of nuts & bolts, checking of fuel, oil, cooling systems & battery in engine.
- Identification of different parts of an engine.

## TRADE : MECHANICAL

### 12<sup>th</sup> VOCATIONAL

#### PAPER-III

### MECHANICAL DRAWING - II

#### THEORY

Time : 2 Hrs

Theory : 30 Marks

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Practical : 50 Marks

Total : 90 Marks

#### Projection

Introduction, Types of Projection - First Angle Projection, Third Angle Projection, Difference between First Angle & Third Angle Projection, Introduction to Isometric Projection, Isometric View, Simple Diagram.

#### Section

Types of Section (Detail with Simple Diagram) - Full Section, Half Section, Off Set Section, Broken section, Uses of Section.

#### Fasteners

Fastening - Temporary fastener, Permanent Fastener, Rivets -  
Introduction, Main Parts, Types - Lap Joint, Butt Joint, Nut and Bolt - Meaning, Use, Types.

#### Screw Thread

Introduction, Terms of Screw Thread, Main Parts of Screw Thread (only Definition with Fig.) - Major Diameter, Minor Diameter, Pitch Diameter, Pitch Line, Crest, Root, Flank or Side, Thread Angle, Pitch, Lead.

#### Assembly Drawing

Introduction, Details of Drawing - Assembly Drawing, Making Assembly Drawing, Main Parts of Assembly Drawing.

#### Auto Cad

Introduction, Concept, Toolbars in Auto CAD - coordinate system, Snap, Grid, ortho mode (Absolute, Relative & Polar), Drawing commands - point, line, arc, circle, ellipse, Editing commands - erase, copy, stretch.

## MECHANICAL DRAWING - II

Time: 3 Hrs

PRACTICAL

Marks : 50

### Isometric Drawings

- Concept of true length and isometric length.
- Conversion of orthographic views into isometric view of simple elements such as V-block, stepped block, hexagonal, bolt and nut.
- Freehand isometric sketches of simple mechanical elements.

### Sectioning

- Concept of sectioning.
- Cutting plane lines.
- Simple example of sectioning - a hollow shaft, pulley and shaft, flange coupling, simple journal bearing bracket.

### Screw Threads

- Introduction to various screw elements - pitch, lead, depth, nominal diameter, core diameter.
- Threads - Single and multi start, left and right, internal and external threads with suitable examples.
- Conventional representation of thread portions.
- General thread profiles such as vee, including pipes and coupling, square, knuckle.

### Development of Surfaces and Interpenetration of Solids

- Concept of solids - cylinder, prism and pyramid, development of surfaces of these solids.
- Interpenetration of cylinders of equal and different diameters with their axis intersecting at right angle.

### Assembly Drawing

- Concept of assembly and disassembling.
- Assembly drawing of simple elements - pulley and shaft, flange coupling, knuckle joint, screw & cotter joint.

### Rivets and Riveted Joints

- Lap joint, Butt joint - Single riveted, double riveted.

### Auto CAD

- Applications of Toolbars in Auto CAD, coordinate system, Snap, Grid, ortho mode (Absolute, Relative & Polar), Drawing Commands - point, line, arc, circle, ellipse, Editing commands - erase, copy, stretch.