

(vi) TRADE : AUTOMOBILE ENGINEERING

12th VOCATIONAL

PAPER-I

WORKSHOP TECHNOLOGY

THEORY

Time : 2 hrs

Theory : 30 Marks

InA : 10 Marks

Practical : 50 Marks

Total : 90 Marks

Safety Precautions

Use of Lathe, Grinding, Arc Welding & Gas Welding, Equipments to Put off Fire : Fire Extinguisher, Sand & Water, First Aid Kit & Importance of First Aid.

Lathe

Introduction, Classification and Constructional Features of Centre Lathe, Various types of Cutting Tools used in lathe and cutting tool materials, Attachments and Accessories of Lathe, Introduction to CNC (Computer Numerically Control) Lathe Machine, Classification of Lathe : Speed Lathe, Bench Lathe, Engine or Centre Lathe, Tool Room Lathe, Turret & Capstan Lathe, Automatic Lathe & Special Purpose Lathe, Purpose of all Type of Lathe Machines in brief, Labeled Diagram of Centre Lathe.

Main Parts of Lathe

Legs, Bed, Head Stock, Tail Stock, Carriage, Apron, Feed Shaft, Lead Screw, Tray, Chuck & Tool Post, Purpose of all Parts in brief with Diagram.

Lathe Operations

Sliding, Surfacing, Taper Turning, Plain and Step Turning, Facing, Chamfering, Drilling, Reaming, Boring, Parting off, Knurling & Threading.

CNC (Computer Numerically Control)

Introduction, Types of CNC in brief.

Welding

Principle of Welding, Classification of Welding Processes, Advantages and Limitations of Welding, Welding Symbols, Basic Principle of Gas and Arc Welding, Difference Between Gas and Arc Welding, Arc Welding Transformer Set, Arc and Gas Welding Equipments, Types of flames in gas welding, Introduction to Electrodes, Flux, Welding Joints, Soldering and Brazing.

GRINDING

Constructional Features of Bench Grinder and its Working.

Drilling

Principle of Drilling, Classification of drilling machines, various operations performed on drilling machines, advantages and disadvantages of drilling, Labeled Diagram of Bench Drill, Types of Drilling Machine.

WORKSHOP TECHNOLOGY

Time: 3 hrs

PRACTICAL

Marks : 50

- Use of tools, equipments in a welding shop.
- Various safety measures used in welding shop.
- Current setting of the transformer according to the thickness of the job and selection of welding rod accordingly, electric arc welding practice.
- Starting and stopping of flames of gas welding.
- Get the correct character of flames and to form the bead with gas welding.
- Centering of given job on central lathe machine.
- Two exercises each in plain turning, taper turning, thread cutting, drilling, boring, knurling, chamfering and parting off.
- Form the bead with gas welding.
- Drilling on given job on bench drilling machine.
- Drilling on given job on hand drilling machine.
- Visit to nearby work shops (makereport).

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PAPER-II

GARAGE PRACTICE AND MANAGEMENT

THEORY

Time : 2 hrs

Theory : 30 Marks

InA : 10 Marks

Practical : 50 Marks

Total : 90 Marks

Auto Servicing

Study of Vehicle Maintenance, Maintenance Schedule and Repair, General Service Procedure for Four Wheelers, Servicing of Engine, Clutches Gearbox, Propeller Shaft, Final Drive and Wheels.

Study of Faults

Engine : Does not Turn Over, Does not Start, Runs but Misses, Losses Power, Over Heats,

Noisy Operation, Stalls and Back – Fires, Excess Fuel Consumption, Smoky Exhaust, Excess Oil Consumption, etc, Clutch : Slips while Engaged, Grabs or Chatters, Drags, Noisy, Incorrect Pedal Play, Gear Box : Noisy, Hard Gear Shifting.

Slip in Gears, Universal Joint - Worn - Out Cross, Less Bearing Life, Propeller Shaft Defect, Differential - Continuous Noise Growing while Rounding a Curve, Wheels - Tyre Wear Types, Tyre Cracks etc, Chassis & Body - Hard & Rough Ride, Vehicle Sway, Sagging Spring, Distortions in Frame and Body.

Engine Tuning

Tuning Process & Compression Testing.

Steering, Suspension & Brake

Hard Steering, Wheel Wandering, Wheel Pulling, Front Wheel Shimmy, Wheel Tramp, Excess Steering Play etc, Hard Brake, Paddle goes to Floor, Dragging and Noisy Brake.

Wheel Balancing and Wheel Alignment

Check Wheel Balancing, Check Wheel Alignment, Toe - in, Toe - out, King Pin Inclination, Camber Angle Adjustment, Brake/ Clutch Adjustment.

Management

Garage Location and Layout, Types, Scope, Selection of Site for Garage, Layout of Building and Machinery.

Maintenance of Shop, Safety and First Aid Facilities

Safety ensured by Building Aspects, Safety ensured by Machinery and Equipments, Safety ensured based on the Human Attitude.

Book Keeping

Registers to be Maintained, Method of Accounting Transactions, Profit and Loss Account.

Elements of Costing

Meaning and Importance of Costing, Difference between Estimating and Costing, Direct Labour Cost, Material Cost, Overhead Cost.

Basic Inventory Control and Store Keeping

Concept of Maximum Stock, Safety Stock, Lead Time, Economic Recorder Quantity, ABC Analysis, Duties of Store Keeper, Method of Keeping Store, Elements of Shop Act Regarding Working Hours, Holidays, Definition of Worker.

Insurance of Vehicles

Meaning of Insurance and its necessity, Different types of Insurance: Comprehensive and Third Party Insurance, Duties of Surveyor, Procedure to get accidental claim and compensation, Cashless Insurance.

Salesmanship

Difference between marketing and selling, Duties of Salesman, Personal Qualities of Salesman, Advertising and Publicity as per New Motor Vehicle Act.

Motor Vehicle Rules as per New Motor Vehicle Act

Motor Vehicle Act - main provisions, Salient features of Motor Vehicle Act, Light Duty Vehicle, Heavy Duty Vehicle, Stage Carriage, Public Carrier, Private Carrier, Invalid Carriage,

Rules

Size of Letters and Background Color of Number Plates of Different types of Vehicles, Location of Lights and Masking, Minimum Space Required for Passenger, Gang Way, Floor to Ceiling, Front and Overhang, Safety Aspect in Terms of Condition of Tyre, Brakes, Steering, Exhaust, Traffic Signs Found Installed on the Road, Signaling by Driver and what it Communicates to other Road Users, Prescribed Forms for - Driving License, Registration, Permit, Fitness Certificate, Offences and Penalties of Driving Vehicle Without - Driving License, Registration, Permit, Fitness Certificate Euro/ Bharat Pollution Control Norms.

'GARAGE PRACTICE AND MANAGEMENT'

Time: 3 hrs

PRACTICAL

Marks : 50

- Servicing of the fuel filter.
- Servicing of fuel injection pump.
- Servicing of fuel injector.
- To exercise air bleeding from fuel supply system.
- Study and sketch the mechanical governor mechanism of a multi cylinder fuel injection pump.
- Checking & adjusting of ignition timing.
- Dismantle a single cylinder diesel engine, clean components, inspect report on the condition of parts, suggest remedial measures, repair, reassemble and test.
- Dismantle a multi cylinder diesel engine of a four wheeler, clean components, inspect report on the condition of parts, suggest remedial measures, repair, reassemble and test.
- Checking of cylinder bore.
- Fitting of bearings, bushes and shells.
- Engine Tuning.

- Obtain all the prescribed forms by Directorate of Transport and fill up details for
 - (a) Driving license.
 - (b) Fitness certificate.
 - (c) Permit etc.
- Study and draw neat sketches of different road signals and signs.
- Inflate tyres with specified pressure and tighten all wheelnuts.
- Prepare a costing and estimate statement for a repair.
- Visit to a nearby auto mobile service station.
- To carry out road test and check exhaust for emission of carbon monoxide.
- Road Testing Procedure.
- Check wheel balancing and Wheel Alignment, toe-in, toe-out, camber angle adjustment, king Pin inclination.

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PAPER-III

AUTOMOBILE SUSPENSION AND CONTROL

THEORY

Time : 2 hrs

Theory	: 30 Marks
In A	: 10 Marks
Practical	: 50 Marks
Total	: 90 Marks

Frames

Function of Frames, Types of Frames for two, three and four Wheelers, Forces Acting on the Frames, Frames Alignment.

Bodywork

Types of Body and their Repair Procedures, Body Denting, Painting and Polishing, Body Accessories and Fittings, Trouble Shooting of Frame and its Maintenance.

Suspension System

Function of Suspension System, Desirable Characteristics of Suspension System, Types of Springs & Shock Absorbers and their Details, Suspension and their types, Independent Suspension System used on Front Wheels, Trouble Shooting of Suspension System and its Adjustments.

Front Axle and Steering

Constructional Features of Front Axle, Front Assembly, Steering Wheel and Column, Steering Geometry, Camber, Castor, King Pin Inclination, Toe - in, Toe out on Corners, Trouble Shooting of Steering and Front Axle Units.

Brake System

Functions of Brakes, Layout of Brake System, Stopping, Stopping Distance, Types of Brakes - Mechanical, Hydraulic, Disc Brake & Parking Brake, Constructional Details of Mechanical and Hydraulic Brake System, Brake Drum, Brake Shoe and Lining Material, Simple Master Cylinder and Wheel Cylinder, Trouble Shooting of Brakes and Adjustments, Bleeding of Brakes.

Wheels and Tyres

Types of Wheel Discs and Rims and their Constructional Features, Tyre Pressure, Spoked Wheels, Casted Wheels, types of Tyres and their Constructional Features, Tubeless Tyres, Tyre Specifications, Tyre Rotation, Causes of Tyre Wear, Tyre Retreating, Trouble Shooting of Tyres and Maintenance.

Electrical System

Lighting Circuits, wiring harness, Layout and its Function, Lamps, Functions of Head Light & Tail Light, Color Coding of Cables, Connectors, Switches, Wind Screen Wiper, Horn, Gauges (fuel level and temperature).

AUTOMOBILE SUSPENSION AND CONTROL

Time: 3 hrs

PRACTICAL

Marks : 50

- Dismantle the front wheel, handle bar assembly of a two wheeler, clean inspect report on the condition of components, repair, reassemble, adjust and lubricate.
- Dismantle the components of rigid front axle beam of a four wheeler, clean inspect report on the condition, repair, reassemble and lubricate the parts.
- Dismount the leaf spring suspension of rear axle, dismantle, clean inspect report on the condition, repair, refit and lubricate.
- Dismount the telescopic shock absorber of front wheel of two wheeler, clean, inspect report on the condition and repair and refit.
- Dismount the wheel assembly from a two wheeler, dismantle, clean, inspect report on the condition of wheel, rims, tyre and tube, rectify defects of tube, refit and remount.

- Dismount the wheel assembly from a four wheeler, dismantle, clean, inspect report on the condition of wheel, rims, tyre, tube, rectify defects of tube, refit and remount.
- Dismantle the disc type brakes, clean inspect and assemble and remount.
- To exercise bleeding of brakes.
- Trouble shooting of lighting system.
- To exercise headlight, beam alignment & focusing.
- Driving practice and road testing.
- Changing of tie end rod.
- Check break oil and refilling.