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(vi)TRADE : AUTOMOBILE ENGINEERING

PAPER-I **ENGINEERING DRAWING**

THEORY

Time : 2 hrs

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

Equipments

Introduction, Care and Use of Drawing Instruments and Material, List of Equipments - Mini Drafter, Drawing Board, T- Square, Set Square, Protractor, Pencil, Compass, Drawing Paper or Drawing Sheet, Eraser, Drawing Pins, Adhesive Tape, Engineering Scales, Sand Paper, French Curves, Instrument Box.

Engineering Drawing

Introduction to Engineering Drawing, Free Hand Lettering on Graph Paper, Layout of Drawing Sheet, Margin, Borderline, Title Block, Technical Lettering, Convention for Lines, Different types of Engineering Lines as per ISI Specifications, Practice in Free Hand Sketching of Vertical, Horizontal, Inclined Lines, Geometrical Figures : Triangle, Rectangles, Circles, Polygon, Ellipse, Parabola and Involutes of a Circle.

Material Representation

Conventional Representation of Different Material in Sections: Shaft, Hollow Pipe, Rectangular, Square, Angle, Channel, I-Section etc.

Dimensioning

Necessity of Dimensioning, Method and principles of dimensioning, Notation of Dimensioning, System of Placing Dimensions - Aligned System, Unidirectional System, Scales, Sizes of Scales.

Workshop Practice

- Description of Hand Tools used in Automobile Workshop, Precautions observed in a Workshop.
- Drawing Sheets of 1st Angle and 3rd Angle Projections of Solids.
- Introduction to Rivets and its Types.
- Concepts of AutoCAD (Computer Aided Design).
- Description of Measuring Tools and Instruments like Outside Caliper, Inside Caliper, Vernier Caliper, Outside Micrometer, Inside Micrometer, Dial Gauge, Marking Block

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and Gauge, Try Square, Bevel Protector, Bench Centre,Depth Gauge, Compression Gauge, Pressure Gauge.

- Surface Plate, Use of Open End Spanner, Ring Spanner, Box Spanner,Sockets, Torque, Wrenches, Adjustable Wrench, Allen Key.
- Introduction to Paints commonly used in Automobile.

ENGINEERING DRAWING

Time: 3 hrs **PRACTICAL** **Marks : 50**

- Use of the hand tools, measuring tools and measuring instrument used in workshop.
- To practice efficient use of files by producing plane surfaces, straight edges of right angle, fillets and round corners.
- To learn efficient and accurate use of hacksaw cutting.
- Fitting a square hole in a M.S.flat.
- Extraction of a broken stud.
- Use of hand tools and equipment used in painting and denting.
- Visit to a nearby mechanical workshop.
- Exercise to learn fixing and setup of mini drafter making margin on drawing sheet and making of title box.
- Practice of letter writing in freehand and Roman.
- Use of hammer (wooden, plastic, and metal) fordenting.
- Use of vernier caliper, calculation of least count and knowing accuracy of instrument.
- Use of micro meter for accurate sizes.
- Use of hand tools pliers, screw driver, spanner, file and dot punch etc in workshop.

PAPER-II **AUTOMOBILE ENGINE**

THEORY

Time : 2 hrs

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

Technical Terms

Define Automobile Engine, Power: H.P., B.H.P.,I.H.P., Carnot Cycle, Diesel Cycle, Otto Cycle, Stroke, TDC, BDC, Compression Ratio, Engine Capacity, Clearance Volume, Swept Volume, Engine Torque, Pressure, Heat, Temperature.

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Engine

Classification of Engines as per stroke, cycle, fuel, ignition, cooling, speed and number and arrangement of cylinders, Principle, Basic Engine Operations, 4-Stroke, 2-Stroke Engine & their difference, Spark & Compression Ignition and their difference.

Engine Construction & Mechanism

Cylinder Block, Crank Case, Cylinder Liner, Cylinder Head, Manifolds, Piston, Piston Pin, Piston Ring, Connecting Rod, Crankshaft, Cam Shaft, Flywheel and Valves.

Ignition System

Battery - Construction, Working and Principle, Concept of Ignition System, Types of Ignition System : Magneto, Battery Ignition & their difference, Capacitor Discharge Ignition System, Distributor, Ignition Coil, Spark Plugs, Ignition Timing, Firing Order.

Fuel System

Types of Fuel Feed System: Gravity and Pump Feed, Petrol: Fuel Line Diagram, Carburetor - Types of Carburetor: Solex and Amal Carburetor, Function and Working Principles of Carburetors, Air Filter, Fuel Gauge, Inlet and Exhaust Manifold, Introduction to MPFI System (Multi Point Fuel Injection Systems), Advantages and disadvantages of MPFI.

Diesel: Fuel Line, Diagram, Fuel Injection Pump, Fuel Feed Pump, Pressure Pipe, Fuel Injector. Introduction to CRDI (Common Rail Direct Injection System).

Engine Cooling System

Cooling Requirement, Cooling Systems, Air Cooling and Liquid Cooling, Advantages and Disadvantages of Air Cooling and Water Cooling System, Water Jacket, Coolant Pump, Cooling Fan, Radiator, Pressure Cap, Anti Freeze Solution, Introduction to Thermostat.

Lubrication System

Necessity of Lubrication System, Principles, Functions, Properties of Lubricating Oil, Classification and Service Range of Lubrication Oil, Introduction to SAE Rating, Lubricating System, Oil Filter, Oil Pump: Gear type and Electrical, Oil Pressure Gauge.

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AUTOMOBILE ENGINE

Time: 3 hrs **PRACTICAL** **Marks : 50**

- To study the construction and working of a two stroke single cylinder air - cooled petrol engine using a sectional model.
- To study the construction and working of a four stroke single cylinder air - cooled petrol engine using a sectional model.
- To study the construction and working of a two stroke single cylinder air - cooled diesel engine using a sectional model.
- To study the construction and working of a four stroke single cylinder air - cooled diesel engine using a sectional model.
- To study the construction and working of; Fuel Feed Pump, Fuel Injection Pump, Diesel Injector.
- To study the construction and working of: mechanical fuel pump, electric fuel pump, carburetor.
- To study the construction and working of lubricating oil pump.
- To study the construction, working and details of maintenance of distributor assembly.
- Batterytesting; Electrolyte Testing by Hydrometer and High Rate Discharge Test.
- Spark plug cleaning and adjusting its gap.
- Carburetor servicing.
- Removal, cleaning & refitting of air cleaners.
- Replacement of cylinder head gasket.
- Practice in Piston Ring Removal.
- Cleaning of fuel tank and oil sump and refilling.
- Check engine compression.
- Precautions to be observed before and after starting the engine.
- To check the thermostat working.

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PAPER-III **TRANSMISSION SYSTEM**

THEORY

Time : 2 hrs

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

Classification of Automobile

Chassis Layout of Conventional Motor Vehicle, Front and Rear - Wheel Drive, Rear Engine Vehicle, Four Wheel Drive.

Clutch

Function of Clutch and its Principle of Working, Types of Clutch, Constructional Details of Single Plate and Multi - Plate Clutches, Centrifugal Clutch, Fluid Coupling, Trouble Shooting of Clutch and its Adjustments.

Propeller Shaft & Universal Joints

Propeller Shaft, Function of Propeller Shaft, Constructional Details of Propeller Shaft, Universal Joints, Function of Universal Joints, Constructional Details of Universal Joints, Types of Universal Joint.

Gearbox

Necessity of a Gear Box, Types of Gears Used, Types of Gear Boxes - Sliding Mesh, Constant Mesh, Synchro Mesh, Constructional Details of Gearbox, Gear Selector Mechanism, Trouble - Shooting of Gearbox and its Adjustments, Introduction to Continuous Variable Transmission (CVT), Automatic Manual Transmission (AMT), Dual Clutch Transmission (DCT).

Differential

Function of Differential, Constructional Details, Working Principles of Differential, Trouble - Shooting of Differential, Adjustments.

Rear Axle

Function of Rear Axle, Types, Constructional Features,Trouble -Shooting, Adjustments.

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TRANSMISSION SYSTEM

Time: 3 hrs **PRACTICAL** **Marks : 50**

- The dismount of single plate dry friction clutch from a vehicle, dismantle, clean the components, inspect report on the condition, repair, reassemble, adjust and remount on the vehicle.
- To dismount the propeller shaft assembly with universal joints from a vehicle, dismantle, clean, inspect report on the condition, repair, reassemble and remount on the vehicle.
- To study the chassis layout of two wheeler, three wheeler and fourwheeler.
- Flushing and refilling of transmission oil.
- To dismount and dismantle the gears of a constant mesh gear box from a vehicle, clean, inspect report on the condition, repair, reassemble, remount and adjust.
- To dismount the rear axle shafts from a four wheel drive, dismantle wheel bearings, oil seals, clean, inspect report on a condition, repair, reassemble, carryout pre - loading adjustment and complete the assembling of oil the components removed.
- To lift the vehicle with the help of jack.
- To identify the cracks on defective chassis frame.
- To study the tightening & loosening of clutch.
- To study the overhauling rear axle of four wheeler.
- Greasing of wheel bearing of four wheeler.