# VIDYASAGAR UNIVERSITY

# AUTOMOBILE MAINTENANCE (MAJOR)

## Under Graduate Syllabus

**(3 Tier Examination Pattern)**

**w.e.f. 2014-2015**

**REVISED**


## Vidyasagar University

**Midnapore 721 102**

**West Bengal**

## AUTOMOBILE MAINTENANCE (MAJOR)

**Total marks : 800**

**(In Part-I, 160 Marks, In Part-II, 320 Marks and in Part-III, 320 Marks)**

Part-I examination will be organized after 1 year of admission into the course and Part-II examination will be organized after 1 year of passing Part-I examination and Part-III examination will be organized after 1 year of Passing Part-II examination.

## MARK DIVISION IN PART-I

Theory: Paper-I & Paper II

**Paper-I (Theory) 80 Marks.**
**Paper-II (Theory) 80 Marks.**

### Part-I

### Paper-I 85L

Gr-A : Strength of Materials : 20L
Gr-B : Theory of Machines : 30L
Gr-C : Principles of Automobile : 35L
(In Examination at least one question from each group should be answered)

### Paper-II : 90L

Gr. A: Constructional details of I.C. Engine : 25 L
Gr. B: Suspension & steering system : 30L
Gr. C: Ignition, Cooling, Lubrication system and Air Conditioning :35L

(At least one question from each group should be answered in examination)

## MARK DIVISION IN PART-II
## Theory: Paper-III & Paper-IV

Practical: Paper-V
Paper-III (Theory) : 80 Marks
Paper-IV (Theory) : 80 Marks
Paper-V (Practical) : 160 Marks

## PART-II
## Paper-III : 85L

Gr. A : Principle of Transmission System : 25L
Gr. B : Components of Transmission System : 25 L
Gr. C : Materials Science & Workshop Technology : 35 L
(At least one question from each group to be answered in examination)

## Paper- IV :85 L

Gr. A : Chassis & body Design : 30L
Gr. B : Automobile Maintenance & Service Stations : 30L
Gr. C : Motor Vehicle Act and Pollution Control : 25L
(At least one question to be answered from each group in the examination)

## Paper-V : 160L(Practical)

Gr. A : Marks : 80 (Two experiments are to be performed in 6 hours)
Gr. B : Marks : 80 (Two experiments are to be performed in 6 hours)

## MARK DIVISION IN PART-III

Theory : Paper-VI & Paper-VII
Practical & Project : Paper-VIII
Paper-VI (Theory) : 80 Marks
Paper-VII (Theory) : 80 Marks
Paper-VIII (Practical) : 160 Marks

## PART-III
## Paper-VI : 80L

Gr. A : Electrical System : 25L
Gr. B : Lighting and Accessories : 25L
Gr. C : Tractor, Powertiller & Farm equipment and Hydraulic equipment: 20L
Gr. D : Important features of Indian Automobiles : 10L
(At least one question from each group is to be answered in examination)

## Paper-VII: 80L

Gr. A : Organisation & Entrepreneurship :25L
Gr. B : Elements of Management :25L
Gr. C : Information(Data) Processing in Automobile Maintenance :30L
(At least one question from each group is to be answered)

## Paper-VIII: 160L

Gr. A :Marks 100 (Two experiments are to be performed in 6 hours)
Gr. B : Marks 60 (Project)

## PAPER-I

Gr. A : Strength of Materials : 20L

Stress, strain, their types, Numerical problems on principle of stresses, Torsion and torsional effect, Shear force, bending moment, Their diagrams, Mechanism and types of mechanism, Numerical Problens.

**Gr. B : Theory of Machine : 30L**

Friction: Introduction, types of friction, coefficient of friction, limiting friction, laws of solid friction and kinetic friction, screw jack.

Belt, Rope and Chain Drive : Introduction, Belt drive, types of belts, Materials used, Velocity ratio, Slip, Length of belt, Comparison, flat and v-belt, Rope drive & Chain Drive.

Gear and Gear Trains : Fundamental laws of gearing, spur, bevel and worm gears, gear train, Interference , epicyclic gear trains.

Cam: Types, displacement diagrams,

Flywheels: Turning moment diagrams, fluctuations of energy and speed.

Governors: Types, Principles, working, Characteristics and performance.

**Gr. C : Principles of Automobiles : 35L**

**Unit-I**: Basic concept of thermodynamics, 1st and $2^{nd}$ laws, reversible, irreversible process and adiabatic, Isothermal Process.

Thermodynamic Cycle: Carnot, Otto, Diesel, Dual cycles and their air standard efficiency, Numerical Problems.

**Unit-II**: Classification of I.C Engines, S.I. and C.I Engines, 2 Stroke, 4-Stroke engines and their working Principle.

**Unit-III**: Engine specifications-Bore, Stroke-length, MEP, I.H.P, B.H.P, S.F.C, mechanical and thermal efficiencies.

**Unit-IV**: Valve timing diagram-2-stroke and 4 stroke engine.

**Unit-V**: Fuel used in I.C Engines, Properties of Fuel, Petrol and Diesel, Fuel additives and- fuel rating (Octane and cetane numbers)
**Unit-VI**: Combustion Process in I.C engines Auto ignition and chemical reaction, pre-ignition MAN and open combustion chambers, effect of knocking, calorific value of fuels, requirement of oxygen for complete combustion.

## Paper-II

### Gr. A : Constructional details and working of I.C engines: 25L

**Unit-I**: Layout of an automobile: Main Components and assemblies.

**Unit-II:** Constructional features and functions of 2& 4 wheelers, Cylinder block, Crankcase, Cylinder head, Oil Pump, Gasket, Crank Shaft, Main Bearing, Vibration dampers, Exhaust system, Inlet and exhaust manifolds, fly-whell, Piston, Piston rings, Piston Pin, Connecting rod, Cams and Camshaft, Valve and Valve mechanism.

**Unit-III:** S.I Engines:
Combustion process, types of fuel feed system, various components of fuel system, fuel tank, fuel filters and screens, fuel losses, fuel gauges, fuel pumps, air cleaners, carburetor and its working its working, trouble shooting, servicing adjustments and M.P.F.I system.

**Unit- IV :** C.I engines:
Combustion and combustion chambers, fuel injection system, fuel tanks, fuel feed pumps, fuel injectors, nozzles and their types, details of nozzles and fuel injector unit, CRDI system.

**Gr.-B: Suspension and steering system: 30L**

**Unit-I** : Suspension system:-
Objectives, principles of working, types of suspension system, independent and rigid axle suspension system, shock absorber and damper, troubles in a suspension system.
**Unit-II**: Steering system:-
Steering geometry, their effect, steering angle, steering mechanism, steering linkages, trouble shooting.

**Gr-C: Ignition, Cooling, Lubrication & Air conditioning: 35L**

**Unit-I**: Ignition System:
Battery, electrical and magneto ignition systems and their troubles.

**Unit-II**: Cooling System:
Importance, types, various components and accessories with troubles shooting.

**Unit-III**: Lubrication system:
Importance, lubricants and their properties , their selections, lubrication system and their working, filters, lubrications in other parts of an automobiles, trouble shooting.

**Unit-IV**: Auto Air conditioning .
Introduction, Air conditioning system, components, effect of Air conditioning of fuel economy, car Air conditioning system, Truck Air conditioning, trouble shooting.

## Part-II
## Paper-III

### Gr-A: Transmission system: 25L

General principle, objectives and types (Manual, Semi-automatic, Automatic, Hydraulic transmission), Gear boxes, resistance to motion of a vehicle, power required for propulsion, acceleration and hill climbing, necessity of gear box, function and types of gears, synchromesh gear box, free wheel drive, gear lubrication, transmission troubles.

### Gr-B: Components of transmission system: 25L

**Clutch System:**
Function, types, clutch linkage, clutch facing &friction material, common faults.

**Propeller Shaft:**
Types, fluid drives, Hotchkiss drive, universal & slip joint, Torque convertors.

**Final drive and rear axle:**
Types of final drives, differential gears and its principles of operation, rear axle and its types.
Front Axle:-Types and their components, swiveling mechanism, front form of motor cycle.

### Gr-C: Material Science and workshop technology: 35L

Mechanical properties of metals, ferrous and non ferrous metals used in engineering practice, Influence of carbon on iron and steel.

Heat treatment of metals- different process-heat treatment equipments and materials.
Hand tools used in different shops, bench work and fitting shop, Hand tools used in fitting shops, chipping, filing, scraping, measuring tools and gauges, limit, fit, allowance and clearance, jug stand and fixtures.
Definition and concept of different mechanical process like rolling, drawing, spinning, firging, casting, welding, brazing, and soldering.
Machine shops- Elementary ideas about different machines like Lathe, Shaper, Grinder, Drill & Milling.

## Paper-IV

### Gr-A: Chassis and Body Design: 30L

**Unit-I**: Chassis, Frame and Body:
Chassis layout and its main components, design features, types of chassis and frames, materials and dimensions for auto body work, method of manufacturing and space requirements.

**Unit-II**: Brake and braking system:
Principles of brakes, braking mechanisms, classifications, bleeding in hydraulic system, brake troubles.

**Unit-III**: Wheels and tyres:-
Types of tyres and their specification, tubeless tyres, radial tyres, friction due to pavement and earth in relation to wear, care and maintenance of tyres and tubes, repair and retreading of tyres.

### Group- B: Automobile maintenance and service stations: 30L

**Unit-I**: Engine servicing and tuning:-

Basic requirements of automobiles engine servicing types and procedures.

**Unit-II**: Garage and service station:-
Location and layout, equipment required in a service station, types of service.

**Unit-III**: Servicing of Motor vehicles:-
Signification of servicing and its types, engine tuning and various instruments used, decarbonizing of engine parts, servicing of batteries, electrical systems, servicing of fuel injection and ignition system, lubrication system, cooling system, braking system and other accessories.

**Group-C: Motor vehicle Act and pollution control: 25L**

**Unit-I**: Inspection and testing of motor vehicles, types of inspection, inspection card, inspection and repair accident inspection, diagnosis of faults, Laboratory and road testing of motor vehicles.

**Unit-II**: Concept of Motor vehicle Act, different rules of Motor vehicle Act, Motor vehicle Act with special reference to pollution control and measure required to safe drive, Effect of pollutant.

**PRACTICAL**

**Paper-V: Practical Mark-160**

(Group-A, Marks-80+Group-B, Marks 80)

Group-A, (80 Marks)

**1. Engineering drawing:**

Scales, projections of solid, surface developments, Isomentric and oblique views, elevations, plans and end views off different objects and design.

**2. 2-stroke and 4 stroke (C.I &S.I engine):**

Valve, Valve seat, Rocker arm, Push rod, Cam shaft, Crank shaft, Piston, piston ring, Connecting rod, Oil pump, fuel pump, Distributor, Oil filter, Fuel filter, Starter motor, alternator, Dynamo, Solex carburattor, inlet manifold, exhaust manifold, water pump, fly-wheel, vibration damper, spark plug, heater plug, injector, F.I.P pump.

Adjustment:- C.B point, piston ring joined, piston ring groove, Cylinder bore, fan belt adjustment, valve tappet.

**3. Fuel system (Petrol engine):**

Over hauling fuel pump, carburetor, fuel fitter and air cleaner, practice in engine tune up in a vehicle.

**4. Cooling system**: Radiator cleaning, thermostate valve, testing fan valve adjust, water pump service, pressure cap testing, over hauling viscous fan.

**5. Lubrication system:**

Oil pump over-hauling and refitting, Replacing oil filter, Drawing engine oil, Repairs oil galaries.

**6. Fuel system** (Diesel engine):
Fuel feed pump over hauling, F.I.P pump single & multi cylinder over hauling, over hauling injector, testing the injector, Fuel bleeding, cleaning the injector.

**7. Suspension system:**
Replacing shock absorber, servicing shackle, over hauling leaf spring, over hauling coil spring, over hauling front suspension system.

**8. Spark plug cleaning and testing:**
Spark plug cleaning, spark plug gap setting and spark plug testing.

**9. Valve timing:**
C.I. & S.I. valve timing adjustment of 2-stroke & 4-stroke.

**10. Firing order set** (Multi cylinder S.I. & C.I. 4-stroke)
petrol- tappet timing, gear timing, chain timing, ignition timing.
Diesel- tappet timing, gear timing, fuel timing.

**11. B.H.P. Test**

**12. Job training or garage practice**
[Student own responsibility]

**Group-B, 80 Marks**

**1. Gear box**: Over hauling, sliding mesh, constant mesh and synchromesh gear box and other gear box.

**2. Clutch**: Over hauling single plate, multi plate, diaphragm clutch and other clutch.

**3. Wheel alignment and wheel balancing**: toe-in, toe-out, caster angle, camber angle, king pin, inclination, adjustment and setting and wheel balance.

**4. Brake system**: Over hauling master cylinder, wheel cylinder, front and rear brake, air servo unit, unloader valve, release valve, hand brake, vacuum bufer, single brake chamber, Brake bleeding, Relining, brake shoes, servicing air tank, servicing brake valve and disc brake, demonstration of working of ABS system, sensors.

**5. Transmission system**: Over hauling universal joint, Differential, remove and refitting propeller shaft over hauling slip joint.

**6. Steering System and power steering**: Overhauling steering linkage, steering gear box adjustment, power steering overhauling.

**7. Servicing tyre**: Repairing tube and tyre puncture.

**8. Check and set self-starter of an engine in order.**

**9. Job training/ Garage practice**
[Student own responsibility]

## Part-III

## Paper-VI
## Theory- 80 Marks

### Group-A: Electrical system 25L

Various electrical elements in an auto mobile automobile batteries and its maintenance generator and battery charging system, negative and positive earth return system voltage and current regulaturs self starter and bendix drive ignition system and its components, ignition timing, ignition advance, setting breaker gap, spark plugs, firing order checking electrical system troubles.

### Group-B. Lighting and Accessories 25L

**Unit-I**

Lighting system: Wiring system wiring diagram colour coding with diagram.

**Unit-II**

Accessories and control:

The horn and its types, wind screens wiper, direction indicators and feashing units, signaling system lamps and their types, starters switch, speedometers, anti burst doorlock anti theft devices, fuel gauges, oil pressure gauges, water temperatuar gauge, car radio, electrical system accessories troubles.

**Group-C: Tractor and farm nequipment and Hydraulic equipment: 20**

Tractor and various attachments hydraulic lift system 3- points linkages, linkage and draq bar automatic depth and draft control, use of tractors in agriculture maintenance and service, principle working, troubles shooting of hydraulic equipment.

**Group-D important features of Indian automobiles: 10L**

Types of automobiles used in India and technical data related to it (2-whceler & 4-wheelers)

**Paper-VIII**
**Theory- 80 Marks**

**Group-A Organisation and entrepreneur-ship: 20L**

**Unit-I** Organisation:
Structure, types functions, organizational behavior, theory of management group dynamic
**Unit-II:** Entrepreneurship
Concept, functions, qualities, role and scope, SSI and other financial Institution, making of project report.
**Unit-III** Safety engineering:
Objectives necessity, types of safety guards, their uses schedule maintenance preventive and break down maintenance.

**Group-B elements of Managements 25L**

**Unit-I** Personnel management**:**
Concept, functions, objectives, training, employment.

**Unit-II** sales and marketing management**:**
Objectives, functions, necessity, distribution system, advertisement, media.

**Unit-III** Financial Management:
Cost, account balance sheet, financial ratios, assets, shares, debentures etc.

**Unit-IV** Industrial relations and industrial Act:
Union, their functions, objectives, factories act, work men's compensation act, minimum wages act.

**Group-C Information (data) processing in Automobiles maintenance 30L**

**Unit-I**
Data representation and data structure,

**Unit-II**
Data base management (foxpro Dos and C programming) formaintenance and management of automobile issues

**Unit-III** Object, oriented programming c++ and auto cad.

## Paper VIII (Practical) 100 marks
## Group-=A 100 marks

**Disassenble the engine component**

1) Over havling cylinder head rockenarm piston, connecting rod, crank shaft pulley, timing geals-chain, fly wheel, crank shaft, of multicylinder engine.

**Electrical system**

2) Battery, battery testing, ignition circuit lighting circuit, battery charging circuit, dynamo circuit, total light circuit, altermetor circuit, Overhauling starter motor, dianamo alernetor,

**M.P.F.I system**

3) Fuel pump overhauling, common rail service, injector testing and service, M.P.F.I Total Sensor System, Fuel line service.

**CRDI**

4) Fuel pump testing, common rail service, injector testing and service, M.P.F.I Total Sensor Fuel line service.

**A.C. system**

5) Overhauling compressor, testing lickage condenser, over-having the blower evolpotetor overhauling, AC pipe service total sensor testing
6) Turbocharger & super charger
7) Over having turbo charger & supercharger unit, impelas shaft inspect and impelar service.
8) Multicylinder FIP pump fresing and calibration test and fuel timing.
9) Measuring of engine speed, checking of fuel oil and coolent of a heavy duty engine,
   Sensor.

10) Demonstration of working principals of various all sensor.
11) Check the exhaust for the recommended pollution level smoke meter.
12) On Computer Programming (c).
13) Garage practice/field report (Students own responsibility).

**Paper- VIII (Project) 60 Marks**
**Group-B:- 60 Marks**

**Projects:**

A Project report taking into account the intensive training in Automobile. Service stations Garages/ Industries giving emphasis on the following subject:

a) Engine Servicing.
b) Engine Tuning.
c) Engine Performance.
d) Diagnosis of engine trouble shooting and suspension system.
e) Gear box, Clutch, Differential, Steering, Cooling system. Lubrication, brake system Running work shop.

However, in the absence of such a facility, a project report on servicing and tunning of engines in the laboratory can also be done. Project work can be done also on computer programming with C, C++, for different management issues on Automobile Maintenance.
(One Project is equivalent to 20 Lectures).