

Easwari Engineering College, Chennai-89
ME2354-Automobile Engineering
Question Bank

PART – A

1. What are the types of automobiles?

- | | | |
|---------------------------|-------------------------------|------------------------|
| i) Purpose: | a) Passenger vehicles | - car, jeep, bus. |
| | b) Goods vehicles | - truck |
| ii) Capacity: | a) Light motor vehicles | - car, motor cycle. |
| | b) Heavy motor vehicles | - bus, coach, tractor. |
| iii) Fuel used: | a) Petrol vehicles | - car, jeep, scooter. |
| | b) Diesel vehicles | - truck, bus. |
| | c) Electric cabs | - battery truck. |
| | d) Steam carriages | - steam road rollers. |
| iv) No. of wheels: | a) Two wheeler | b) Three wheeler |
| | c) Four wheeler | d) Six wheeler |
| v) Drive of the vehicles: | a) Single wheel drive vehicle | |
| | b) Two wheel drive vehicle | |
| | c) Three wheel drive vehicle | |
| | d) Four wheel drive vehicle | |
| | e) Six wheel drive vehicle. | |

2. What are the four main arrangements for engine positions?

- i) Front engine with rear wheel drive.
- ii) Transverse engine with front wheel drive.
- iii) Four wheel drive
- iv) Rear engine with rear wheel drive.

3. What is an in-line engine?

In this type the cylinders are arranged by side in one row. The cylinder nearest to the radiator is called cylinder number 1.

4. What is a vee-type engine?

This type is very compact in construction and has a common crank case. In this arrangement the axes of the cylinders are inclined to one another usually at 60° .

Vee type engines are shorter.

5. What is a 'F' head engine?

This is a combination of L and I engines. Inlet valve is in the head and exhaust valve in the cylinder. Both valves are operated by the same camshaft.

6. What are cylinder liners?

The cylinder may wear out after frequent use. Hence the cylinders have to be replaced, but this is very costly. Therefore, instead of replacing the complete cylinder it is better to fit a parallel sleeve in the block. This sleeve is known as cylinder liner. They are made of special alloy iron containing manganese, nickel and chromium.

7. What are the functions of Piston rings?

- i) Prevention of leakage of gas into the crankcase.
- ii) Prevention of lubricating oil film.
- iii) Easy transmission of heat from piston to cylinder wall.
- iv) Balancing of side thrust of the piston.

8. The valves are usually made of stainless steel. The valves used in modern passenger car engines are termed as poppet or mushroom valves.

9. What are manifolds?

The term manifold is applied to the external pipes or castings containing gas passages that connect the carburettor and the pipes to the inlet and outlet ports of the engine. In order to maintain maximum velocity of the gases and to ensure the best possible breathing, it is obviously desirable that the passages should offer minimum resistance to flow.

10. What are the qualities of a good liner?

- i) Strength to resist stresses due to pressure.
- ii) Hard to resist wear.
- iii) Capable of taking a good bearing surface.
- iv) Strength to resist stresses due to heat flow through the liner.

11. What are the forces acting on crank shaft?

- i) Centrifugal force
- ii) Inertia force
- iii) Twisting and shear forces.

12. What is the purpose of cooling system?

The purpose of cooling system is to keep the engine at its most efficient operating temperature at all engine speeds and all driving conditions. The cooling system is designed to remove about 30 to 35% of heat produced in the engine cylinder.

13. What are the methods of engine cooling?

- i) Air cooling
- ii) Water cooling
- iii) Liquid cooling
- iv) Steam cooling

14. Explain briefly the principle of water cooling system.

In this method of cooling, water is circulated through water jackets around each of the combustion chambers, cylinders, valve seat and valve stems. The circulating water, when passes through the water jackets in the block and cylinder head, takes heat of the combustion. When it passes through the radiator, it is cooled by air drawn through the radiator by a fan and by air flow developed by the forward motion of the vehicle.

15. What is a radiator?

Radiator is a device for having a large amount of cooling surface to the large amount of air, so that the water circulating through it is cooled efficiently. It consists of a upper tank and a lower tank and between them a core. The upper tank is connected to the water inlet, and the lower tank is connected to the water outlet. The core is a radiating element which cools the water.

16. What is the purpose of lubrication in an automobile engine?

The lubricant is called upon to limit and control :

- i) Friction
- ii) Metal to metal contact
- iii) Over heating
- iv) Wear
- v) Corrosion
- vi) Deposits.

17. What are the different types of lubricating systems?

- i) Petroil system ii) Splash system & iii) Full pressure systems.
- 18. What are the different types of oil filters?**
i) Cartridge type ii) Edge type & iii) Centrifugal type.
- 19. What is a thermostat?**
A thermostat valve is used in the water cooling system to regulate the circulation of water in system to maintain the normal working temperature of the engine parts during the different operating conditions. This is fitted in the water outlet. Generally the thermostat valve does not permit the water below 70⁰c.
- 20. Why anti freeze compounds are added to water?**
The minimum temperature of cooling water in cooling system must be carefully maintained. If the water freezes in the cooling circuit the resulting expanding force may crack the cylinder block radiator and pipes. In order to prevent this defect anti freeze chemicals are added to the water.
- 21. Name some anti freeze chemicals.**
i) Wood alcohol ii) Ethanol iii) Glycerine
iv) Propylene mixture v) Denatured alcohol &
vi) Ethylene glycol.
- 22. What is petrol injection?**
Petrol injection system is used in number of modern cars like Jaguar and Benz. It ensures unrestricted fuel supply and controls it at all times of the engine operation. Petrol injection gives both higher power and low specific consumption.
- 23. State Ackermann principle of steering.**
The basic principle of Ackermann steering system to obtain true rolling. The Ackermann steering gear mechanism consists of a cross link KL connected to the short axes AC and BD of the two front wheels through the short arms AK and BL. Forming bell crank levers CAK and DBL respectively. When the vehicle is running straight the cross link KL is parallel to AB. The short arm AK and BL both make angle α to the horizontal axis of chassis.
For correct steering, $\cot \Phi - \cot \theta = b / l$
- 24. What is centre point steering?**
If the imaginary king pin axis and the centre line of the wheel meet at the road surface this condition is known as 'Centre point steering'. If this condition is allowed in the front wheels the bending stress and the splaying couple are greatly reduced.
- 25. Define camber angle.**
The angle between the centre line of the tyre and the vertical line when viewed from the front of the vehicle is known as camber. Camber should not exceed 2⁰.
- 26. Define caster angle.**
The angle between the vertical line and the king pin centre line in the plane of the wheel is called caster angle. The caster angle in modern vehicle ranges from 2 to 8 degrees.
- 27. What is toe-in?**

The front wheels are usually turned in slightly in front so that the distance between the front ends A is slightly less than the distance between the back ends B, when viewed from the top. The difference between these distances is called toe-in. The amount of toe-in is usually 3 to 5 mm.

28. What is over steering?

When the rear slip angle is greater than the front slip angle, the vehicle tends to move away from the direction of the side force. This is known as over steer and is advantageous when the vehicle is moving on roads having many bends and curves.

29. What is under steering?

When the front slip angle is greater than the rear, the vehicle tends to steer in the direction of side force. This is called under steer. This provides greater driving stability especially when there is a side wind.

30. Define steering gear ratio or reduction ratio.

It is defined as the ratio between the number of degree of rotation of the steering wheel and number of degrees through which the cross-shaft is made to rotate at the same time. This ratio varies between 14:1 and 24:1 in passenger cars without power steering.

31. What is reversible steering?

When deflection of the steered wheels due to road surface is transmitted through the steering linkage and steering gear box to the steering wheel the system is said to be reversible.

32. What is irreversible steering?

When the steered wheels do not transfer any deflection to the steering wheel, the steering system is said to be irreversible.

33. Classify steering gear box.

i) Worm and wheel ii) Worm and sector arm wheel
iii) Screw and nut iv) Cam and lever & v) Rack and pinion.

34. What are the types of steering gear box?

i) Worm and double roller steering box
ii) Cam and double lever steering box
iii) Rack and pinion steering &
iv) Recirculating ball steering.

35. What is the objective of power steering?

The main objective of power steering is to reduce the driver's effort in steering. The system may employ electrical devices, pneumatic and hydraulic pressures. It is easier with power steering to turn sharp corners.

36. What is the principle of power steering?

The slight turning of the steering wheel actuates a valve. This movement makes the fluid from a reservoir to enter into the appropriate side of a cylinder under pressure. This pressure is applied on one side of a plunger suitably to operate the steering linkage.

37. How does a tyre being specified?

i) Width ii) Speed rating and diameter

iii) Ply rating.

38. What are the causes for rapid wear of a tyre?

Rapid wear: Operating condition like rough surface, high speed.

Remedy: Maintain correct speed, correct pressure.

39. What are the causes for one side wear of a tyre?

Causes: Incorrect camber angle.

Remedy: Correct it.

40. What are tubeless tyre?

Tubeless tyre does not enclose the tube. The air under pressure is filled in the tyre itself. A non-return valve is fitted to the rim through which the air is forced inside the tyre. Any hole in tubeless tyre can be repaired simply by rubber plugging.

41. What are the causes of tyre wear?

i) Incorrect inflation ii) Incorrect caster, camber or toe-in.

iii) Over loading iv) Wrong loading v) Misalignment

vi) Unequal tyres vii) Careless driving & viii) Worn king pins.

42. What is the need of suspension system?

i) To safeguard the passengers and goods against road shocks.

ii) To pressure the stability of the vehicles while in motion.

iii) To maintain proper steering geometry.

iv) To bear the torque and braking reaction.

43. What is independent front suspension?

The term independent suspension system means any arrangement that connects the road wheels to the frame; in which the rise or fall of one wheel has no direct effect on the other wheels.

44. What are the advantages of independent front suspension?

i) More space for engine accomodation.

ii) It enables front springs to be arranged for enough apart to promote understeer conditions, which is preferable to oversteer.

iii) It may provide softer suspension.

45. What is sprung and unsprung weight?

Sprung weight is the weight of all the parts supported by the springs including the weight of springs.

Unsprung weight is the weight of all parts between the springs and the road and a portion of the spring weight itself.

48. What are the functions of a spring?

i) To provide cushioning effect for the passengers.

ii) To absorb and store energy.

iii) To prevent or reduce the transmission of road shocks as far as possible.

49. What are spring shackles?

Spring shackles provide the link by means of which the chassis frame is connected to the leaf spring. The shackles help the spring to spring in and out during flatter and rebounding. This is provided for lubricating purposes.

50. What is a torsion bar?

A torsion bar is a steel bar which functions by twisting and absorbing shear stress only. This is generally used in front independent suspension. The energy absorbed per unit volume by torsion bar is 4 times that of a leaf spring and 3 times that of a coil spring.

51. What are the advantages of torsion bar?

i) Light ii) Occupies less space iii) Stiff iv) Easy to assemble & v) Double acting.

52. What is a shock absorber?

Shock absorber control the spring action during compression and rebound and prevent bouncing. To control vibration shock absorber is used.

53. What are the types of shock absorber?

i) Mechanical shock absorber
 ii) Hydraulic shock absorber
 a) Van type b) Piston type c) Telescopic type
 d) Single acting & e) Double acting.

54. What is a clutch?

The clutch is a mechanism with the help of which the engine is connected or disconnected whenever required, from the rest of the transmission. The clutch is located between the engine and the transmission.

55. What are the types of clutch?

i) Wet clutch ii) Dry clutch iii) Cone clutch
 iv) Centrifugal clutch v) Positive clutch and
 vi) Vacuum clutch

56. What are the requirements of a clutch?

i) Gradual engagement ii) Torque transmission
 iii) Heat dissipation iv) Dynamic balancing v) Vibration damping and vi) Lightness.

57. What are the functions of clutch?

i) To engage or disengage the rest of the transmission as required.
 ii) To transmit the engine power to rear wheels without shock.
 iii) To enable the gear to get engaged when the vehicle is in motion.

58. What is a centrifugal clutch?

The centrifugal clutch uses centrifugal force, instead of spring force for keeping it in engaged position. Also it does not require clutch pedal for operating the clutch. The clutch is operated automatically depending upon the engine speed. The vehicle can be stopped in gear without stalling the engine. Similarly the vehicle can be started in any gear by pressing the accelerator pedal.

59. What is an overrunning clutch?

This is called free wheel clutch and is placed next to gear box. The driving member is connected to the gear box shaft while the driven member is connected to the propeller shaft. There are three slots provided with spring actuated rollers through wedges provided in between the two members.

60. What is a fluid coupling?

This is a liquid coupling used to transmit the engine turning force to a clutch. It is located between the crankshaft and the clutch. Air is the fluid used as a medium of power transmission.

61. Compare fluid coupling and torque converter.

Sl.No.	Fluid coupling	Torque convertor
1.	Contains only two members impeller and turbine.	Three members impeller, turbine and a stator.
2.	Simply a torque transmission unit.	Torque multiplication unit 3:1 to 4:1
3.	Efficient at high speed.	Inefficient at high speeds.
4.	Serves as an automatic clutch.	Serves as an automatic clutch as well as torque multiplier.

62. What are the functions of brake?

- i) To stop the vehicle,
- ii) To control speed, when and where required quickly and efficiently,
- iii) To control the vehicle while descending along a slope,
- iv) To keep the vehicle in the required place after bringing it to rest even when the operator is not present.

63. What are the types of brakes?

- i) Feed brake ii) Hand brake iii) Mechanical brake
- iv) Hydraulic brake v) Vacuum brake vi) Electrical brake
- vii) Air brake and viii) Disc brake.

64. What are the braking requirements?

- i) It should develop maximum possible retarding force irrespective of road conditions and quality.
- ii) The response time should be as minimum as possible.
- iii) Must be reliable.
- iv) Should be of minimum weight.
- v) Noise and vibration are to be minimum.

65. What are brake drums?

Brake drums are made of steel or alloy of chrome nickel. The walls of the drums are very thin and made of centrifugal castings. The brake drum assembly is mounted on the wheel bolts between the hub and the wheel, so as to revolve with the wheel. The drum surrounds the brake shoes. The drum diameter ranges from 200 to 375 mm.

66. What is a master cylinder?

The master cylinder is the heart of the hydraulic brake system. The master cylinder is the fluid reservoir for the brake and is operated by the brake pedal.

67. What is tandem master cylinder?

Tandem master cylinder refers to the master cylinder arrangement with two separate cylinders and reservoir in the same master cylinder assembly. One cylinder to operate the front brakes and the other to operate the rear brakes. So,

because of this arrangement even if any one of the cylinders goes out of order, the other cylinder functions for the operation of the brake.

68. What are the merits of air brakes?

- i) More effective: heavy effort at brakes.
- ii) Employs only air as working medium which is easily available.
- iii) Better control.
- iv) Reduced stopping distance.

69. What are disc brakes?

The motor vehicles are now being fitted with disc brakes. It is normally of a caliper type, consisting of a rotating disc and two friction pads on either side. The disc is made of high grade grey cast iron. The friction pads are made up of asbestos fibre. The chief advantage of the disc brake is their resistance to fading.

70. What are the merits of disc type brakes?

- i) Better stability because of uniform pressure distribution over the pads.
- ii) Less bearing load on the application of the brake.
- iii) Higher temperature does not affect the disc pads.
- iv) Simple design of brake adjuster.
- v) Less weight
- vi) Repair and maintenance are easy.
- vii) Resistance to fading.

71. What are power brakes?

Normally for operation of brakes some physical effort is applied on the brake pedal. If instead of physical effort some other external source of power is applied then it is known as power brake. The external sources may be air pressure, engine vacuum or electrical energy from battery.

72. What are the advantages of power brakes?

- i) Reduces driver's effort.
- ii) Higher braking efficiency.
- iii) More rapid in action.
- iv) Lesser time lag.
- v) Used in trailers and tractors.
- vi) Flexible hose connection.

73. What are the various brake troubles?

Sl.No.	Troubles	Causes
1.	Pedal can be moved to strike floor board without producing braking action.	1. Normal wear of linings 2. Defective master cylinder 3. Air in system
2.	One wheel drag	1. Brakes too tight. 2. Clogged liner.
3.	Brake fade	1. Too hot brake drum 2. Glazed lining.
4.	Spongy pedal	1. Air in line 2. Poor shoe adjustment.

5.	Car pulls to one side on brake application	<ol style="list-style-type: none"> 1. Oily lining 2. Loose wheel bearings. 3. Low tyre pressure.
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74. What are the functions of the gear box?

- i) To exchange engine power for greater torque and provide mechanical advantage to drive the vehicle under different operating conditions.
- ii) To provide reverse motion.
- iii) To provide neutral position and disallow power flow to the rest of the transmission.

75. What is the necessity of gear box?

- i) To regulate the torque by selecting the appropriate speed range.
- ii) To regulate vehicle speed at which maximum torque is available.
- iii) To balance the tractive effort with the sum of the various forces tending to oppose the motion.

76. Define tractive effort.

Tractive effort is the driving force which acts at the rear wheel to propel the vehicle. To obtain uniform speed, the total tractive resistance should be balanced by the tractive effort. Tractive effort is produced at the point of contact of the wheel on the road.

$T = \text{Total torque at the wheel} / \text{Wheel radius}$

$= n \times m \times r \times T$

where,

- n = gear box ratio
- m = final drive ratio
- r = radius of the wheel
- T = engine torque.

77. What are the type of gear boxes?

- i) Selective type
- ii) Progressive type
- iii) Epicyclic or planetary type.

78. What is an epicyclic gear box?

This is also known as planetary gear train. One shaft is called sun gear shaft and the other shaft is called planet carrier shaft. The epicyclic gear box uses no sliding dogs or gears to engage, but different gear speeds are obtained by merely tightening brake bands on the gear drums, which simplify gear changing.

80. A three speed gear box provides 3 speed gears: I, II, and top gear.

A four speed gear box provides 4 speed gears: I, II, III and top gear.

A five speed gear box provides 5 speed gears: I, II, III, IV and top gear.

81. What is gear shifting?

The gears are shifted by means of a gear shift lever. In manually operated selective transmissions, the gear shift lever is located either on steering column or on the floor board. To shift any gear the clutch pedal is depressed to disconnect momentarily the engine from the transmission. Then the gear shift lever is moved

first to demesh the previous gear and then to mesh the desired gear. The directions of the first, second, third, neutral and reverse gears are marked on the knob of the gear shift lever.

81. What is a transfer case?

The transfer case is essentially a two speed transmission located at the rear of the standard transmission which provides a low and direct gear. It also provides a means of connecting the power to the front axle. The shifting mechanism is located on the transfer case.

82. What is a propeller shaft?

The propeller shaft is a driving shaft that connects the transmission to the differential. The output shaft or main shaft from the transmission and pinion shaft extending from the differential unit are connected to the propeller shaft and the universal joints. It is made of strong steel tube.

83. What is a universal joint?

A universal joint is used where two shafts are connected at an angle to transmit torque. One universal joint is used to connect the transmission main shaft and the propeller shaft, other universal joint is used to connect the other end of the propeller shaft and the differential pinion shaft. A simple universal joint consists of two y shaped yokes, one on the driving shaft and other on driven shaft and a cross-piece called the spider.

84. What is a constant velocity joint?

It consists of two individual universal joints linked by a ball and socket. The ball and sockets splits the end of the two propeller shafts between the two joints. The type of joint permits uniform motion. Because the two joints are operating at the same angle, the acceleration resulting at any instant from the action of one universal joint is cancelled out by the deceleration of the other and vice versa. In this type of joint both the shafts rotate at the same speed throughout its revolution at any degree of inclination.

85. What is a slip joint or sliding joint?

A slip joint consists of outside splines on one shaft and matching internal splines on the mating hollow shaft. The splines cause the two shafts to rotate together as well as to permit them to move endwise. This compensates for any change of length of the propeller shaft. So the rear axles move toward or away from the car frame.

86. What is the purpose of final drive in a motor vehicle?

- i) To turn the drive through 90° , so that the torque may be transmitted from propeller shaft to the rear axles.
- ii) To provide a permanent gear reduction.

87. What is a hotch kiss drive?

It consists of propeller shaft, two universal joints and a slip joint. This is the simplest one available. For rear axle drive apart from taking the weight of the body, springs also bear the torque reaction, driving thrust and side thrust.

88. What is the need for two universal joints?

When the spring is deflected, the level pinion shaft changes its position. Suppose there is only one universal joint at the front end of the propeller shaft it will bend both the springs. This situation forces employing two universal joints.

89. What is a torque tube drive?

In torque tube drive, the propeller shaft is enclosed in a hollow tube. The tube is rigidly bolted to the differential housing at one end and is fastened at the other end to the transmission through a some what flexible joint. The tube incorporates bearings which support the propeller shaft. Only one universal joint is necessary on this type of drive. It is usually placed between the transmission and the propeller shaft.

90. What are live and dead axles?

The front axles are usually dead axles because they do not rotate, in contrast to the live axles which are used in the rear axle to transmit power to the rear wheels. A live front axle as compared to the dead axle, has the additional function of transmitting the driving power taken from a transfer gear box to the front wheels.

91. What is the need of a differential?

When a car travels in a straight line, the two rear wheels turn on the road exactly at the same speed. There is no relative movement between the two rear wheel. The propeller shaft may be served rigidly in this case, with the rear axle to rotate the rear wheels together. But when the car takes a turn, the outer wheel travels on a longer radius than the inner wheel. The outer wheel turns faster than the inner wheel, there is a relative movement between the two rear wheels. If the two rear wheels are rigidly fixed to a rear axle the inner wheel will slip which will cause rapid tyre wear, steering difficulties and poor road holding. Therefore, there must be some devices to provide relative movement to the two rear wheels when the car is taking a turn. The differential serves this purpose.

92. What is a self locking differential?

A self locking differential consists of two clutches, one on each side, to lock the side gears and axles to the differential cage, when the differential action is not required. The clutch consists of a side gear ring and two clutch discs splined to the axle shaft, and three clutch plates connected to the differential housing by lugs. This type of differential is available as a special equipment on passenger cars and also knows as non-slip differential.

93. What is a four-wheel drive?

In a four wheel drive vehicle, the power from engine flows to all the four wheels. A short propeller shaft is connected horizontally between the transmission and a transfer gear box. This transfer gear box is located nearly at the centre of the vehicle. In a four wheel drive vehicles, the engine is usually mounted higher than it is in passenger cars and many light commercial trucks to protect it from water, mud and obstacles. The four wheel drive is used on heavy duty military trucks and jeeps.

94. What are the advantages of four wheel drive?

- i) Large angular movement in steering.
- ii) Power flow to all the four wheels equally.
- iii) High torque transmission.
- iv) Better traction and road grip.

95. What are the types of battery?

- i) Lead- acid battery
- ii) Alkaline battery
 - a) Nickel iron type b) Nickel cadmium type
- iii) Zinc air battery

96. What are the components of a lead acid battery?

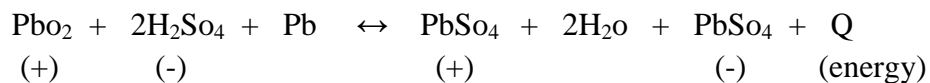
- i) Container ii) Cell covers iii) Plates iv) Electrolyte
- v) Separators

97. Explain the principle of lead acid battery.

The lead acid battery is most widely used in automobiles. There are two rods, one is of pure lead and the other one is of pure lead peroxide which are in a solution of dilute sulphuric acid. Then an electric voltage is generated between the rods. The lead peroxide forms the positive pole and the pure lead forms the negative pole.

98. What are the chemicals used in a battery?

- i) Sponge lead ii) Lead oxide iii) Sulphuric acid.

99. Write down the chemical reaction that takes place while the battery is charged and discharged.**100. What are the different methods of battery rating?**

- i) 20 Hour rating ii) 20 minute rating iii) Cold rating

101. What is cold rating?

This shows the starting ability of the battery when used in cold water. This rate refers to the time in minutes to start a battery delivering 300 amperes at 18⁰ C without the cell voltage dropping below 1 volt.

102. What do you mean by recharging of battery?

When a battery is discharged and is not capable of delivering any current it may be recharged. This is done by supplying it with a flow of current from some external source, such as generator, which forces current through the battery in a reverse direction. Thus the plates are restored to their original composition and the battery becomes recharged.

103. Define battery capacity.

The capacity of a battery has been defined as the amount of current it can deliver. The amount of current depends upon the following factors :

- a) No. of plates
- b) Area of plates
- c) Quantity of the electrolyte
- d) Temperature.

104. What is the instrument used to check the specific gravity of automobile battery liquid?

Hydrometer.

105. What is a cut –out relay?

The cut – out relay is simply a magnetic switch. The cut-out relay or circuit breaker closes the circuit between the generator and the battery when the generator is producing current. Also, it opens the circuit so that the battery cannot discharge back through the generator, when the generator stops or slow down. The D.C generator is connected to the battery through a cut-out relay and an ammeter.

106. What is the principle of regulators?

The regulator is a device to control the output of the generator with the high speed of the generator, the high voltage and /or current output is prevented from damaging the system. This regulator also ensures the rated output at normal speed. The generator output gets controlled by controlling either the speed or strength of the field by controlling the current flow in the field winding. This is achieved by removing or adding a resistance in the field circuit.

107. What is a bendix drive?

This is a good example of inertia drive. It is fastened in the armature shaft of the starting motor. The drive head is keyed to the end of the armature shaft . Initially the drive pinion is not with the flywheel ring gear. When the cranking motor is switched on the armature shaft begins to rotate .The pinion is prevented from picking up the speed from the sleeve due to inertia. The sleeve begins to turn with the pinion. This forces the pinion to move end wise along the sleeve.

108. What do you mean by cranking the engine?

Cranking the engine means to rotate the crankshaft by applying torque on it so that the piston may get reciprocating motion.

109. What is an over running clutch drive?

The starter lever is linked to a starter pedal which extends into the drivers compartment and is operated by foot pressure. When the starter pedal is pressed, the shift lever compresses the drive shaft and spring which ultimately pushes the over running clutch and pinion gear assembly toward the fly wheel. The starter which is closed by the shift lever when the starter pedal is fully pressed. As soon as the starter switch is closed, the pinion gear will run and engage with the flywheel, thus starting the engine. When the engine starts the over running clutch comes into action.

110. Explain the working of magneto ignition system.

In this system, there is no need for the storage battery to provide the spark. The magneto ignition system itself generates current, boosts the low voltage and distributes it to the individual cylinder. The basic principle of magneto is that electricity is produced by a revolving coil of a wire in a magnetic field. A magneto consists of a primary and secondary circuits.

removed. This process of identifying the causes and the remedial action is termed as trouble shooting. Trouble shooting is a means of analysis, diagnosis and rectification of troubles.

120. What do you understand by preventive maintenance?

This refers to the keeping procedure to prevent troubles which often lead to a major overhaul. The following points relate to preventive maintenance:

- i) Fuel tank must be full; moisture must be removed.
- ii) Lubricant of the proper viscosity is to be used.
- iii) Battery is to be kept in full charge.
- iv) Rust formation must be prevented.
- v) Type inflation is to be checked etc.

121. What are the reasons for engine not starting?

- i) Choked fuel supply ii) Flooded carburetor iii) Dirty spark pluggap
- iv) Discharged battery & v) Poor compression.

122. What are the reasons for clutch judder?

- i) Linings not making even contact.
- ii) Pressure plate not parallel with flywheel.
- iii) Bent clutch shaft.

123. What is overhauling?

This is a general process consisting of cleaning, inspection, diagnosis, readjustment, minor replacement and tuning up of engines.

124. What is the need for engine overhauling?

- i) Excessive fuel and oil consumption ii) Disability to run slowly
- iii) Loss of compression iv) Engine noise v) Excessive carbon deposit
- vi) Occurrence of mechanical knocks.

125. What is the purpose of engine tune up?

The purpose of engine tune up is to maintain or restore the original performance and economy of the engine. An engine compression test should be completed before the tune-up procedure. This includes testing, servicing and adjusting of different components in an engine for smooth working of the vehicle.

126. What is engine tuning?

The procedures followed in readjusting and replacing the parts, so as to obtain the performance of a brand new engine is termed as engine tuning.

127. Name some garage equipments.

- i) Small garages – for tracing minor defects. They contain servicing and routine tools needed for a mechanic.
- ii) Medium garages – welding set, nozzle tester, washing machine.
- iii) Larger garages – special machines for reboring, valve refacing, chassis alignment equipment.

128. Name some testing equipments.

- i) Vacuum gauge ii) Dwell tester iii) Exhaust gas analyzer
- iv) Coil and condenser tester v) Condenser tester
- vi) Compression tester.

129. What measurements are usually possible in an exhaust gas analyzer?

When the fuel supplied to the engine is not completely utilized in the combustion process, the fuel consumption rate is not satisfactory. The effective utilization of the fuel can also be evaluated by percentage analysis by volume of the pollutant in the exhaust gas from the engine. Conventional analyzers like orsat apparatus, CO₂ meter are used.

PART – B**UNIT –I**

1. Classify the automobile vehicles in detail.
2. Write short notes on cylinder liners and piston rings.
3. Explain the different types of cylinder arrangements of the automobiles?
4. Draw the layout of chassis? Explain the different types of chassis?
5. Explain with a neat sketch the valves and types of valve operating Mechanisms used in automobile
6. Explain with a neat sketch the working principle of cone clutch.
7. Explain with a neat sketch the working principle of Diaphragm clutch.

UNIT –II

- 1.. Explain with a neat sketch the working principle of hydraulic brake system
2. Explain with a neat sketch the working principle of Air brake system
3. Explain with a neat sketch the working principle of sliding mesh transmission system.
4. Explain with a neat sketch the working principle of Hydra-matic transmission system.
5. Explain with a neat sketch the working principle of hydraulic shock absorber.
6. Explain with a neat sketch the working principle of Torque – Tube drive.
7. Why is lubrication necessary in a Car?
8. Describe with a neat sketch the force feed lubricating system of a four cylinder engine?
9. What are the various components of a cooling system? Explain them.
10. Explain with the help of a suitable sketch the function of any thermostat.

UNIT –III

1. What are the three most common types of steering gears? What are the essential differences between them.
2. Discuss the merits and demerits of an independent front suspension system.
3. Explain with a neat sketch the working of a four wheel steering used in an automobile.
4. Write briefly about “ Rubber suspension” employed in suspension system.
5. With neat sketch discuss the functions, merits and demerits of a diaphragm clutch.
6. Describe the servo or power mechanism used in brakes in a vehicle.
7. Discuss the advantages and disadvantages of a disc brake used in automobile.

8. With neat explain the principle of hydraulic brake system
9. Describe with a neat sketch the working principle of single plate clutch
10. Describe with a neat sketch the working principle of Multi plate clutch
11. Describe with a neat sketch the working principle of Cone Clutch
12. Describe with a neat sketch the working principle of Centrifugal Clutch
13. Describe with a neat sketch the working principle of Semi-Centrifugal clutch

UNIT -IV

1. Describe the sliding mesh gear box giving its necessary functions.
2. Explain the functions of propeller shafts and their types.
3. Explain Hotch Kiss drive with neat sketch.
4. Explain the functions of a differential with a neat sketch.
5. With neat sketch explain the lightning system of an automobile
6. Describe the construction and working of any battery used in automobile.
7. Explain the working principle of Torsion bar with a neat sketch.
8. Describe the various types of springs used in an automobile.
9. Describe with a neat sketch the working principle of Mechanical brake
10. Describe with a neat sketch the working principle of universal & constant velocity joints
11. Describe with a neat sketch the working principle of Synchromesh gear box
12. Describe with a neat sketch the working principle of rear and front axles
13. Describe with a neat sketch the working principle of Epicyclic Transmission system
14. Describe with a neat sketch the working principle of Starter motor
15. Describe with a neat sketch the working principle of Bendix Drive
16. Describe with a neat sketch the working principle of Solenoid Drive
17. Describe with a neat sketch the working principle of Magneto coil ignition system
18. Describe with a neat sketch the working principle of Battery Coil ignition system.
19. Differentiate between the construction of conventional, radial ply and tubeless tyres. Why are spikes or nails fixed in racing types.

UNIT -V

1. What is meant by fuel cells? Explain the working hydrogen fuel cell.
2. Write short notes on LPG, Hydrogen and biodiesel as an alternative fuel for an automobile engine.
3. Explain Hydrogen as an alternative fuel for an automobile engine?
4. Write short notes on hybrid vehicles.

UNIT 1

Two Marks Questions (Part A questions)

1. .What are the functions of frame?
2. List out the various materials used in the construction of chassis frames.
3. . Write down any two main sections of vehicle construction.
4. What are two types of vehicle suspensions?
5. What loads are coming to axle?
6. What is the function of gear box?
7. Why you need a gear box?
8. Name the different kind of resistances to vehicle motion
9. Why is the frame narrow at front?
10. List out the various materials used in the construction of vehicle body
11. Why are the side members of the frame upswept at two places?
12. What is the function of a bumper?
13. What are the stresses to which the frame members are subjected to?
14. Name few components of engine.
15. What are the types of frames?

16 Marks Questions (Part B Questions)

16. Compare the merits and demerits of a frameless construction with those of the conventional framed construction. (16)
17. Explain the following terms:
(i) Load distribution in frames (ii) Frame types with sketch (iii) Frame materials (iv) Frame testing. (16)
18. Explain the construction of various frames used in automobiles with neat sketch. (16)
19. (i) Define chassis, frame, body and suspension. (4)
(ii) Explain briefly about structure of passenger car with neat sketch. (12)
20. (i) Discuss the various resistances to vehicle motion (8)
(ii) Discuss the need of a gear box. (8)
21. Explain any five components of engine with neat sketch. (16)
22. Explain the materials used to manufacture the components of engine (16)
23. Explain briefly the various types of chassis construction with suitable diagrams. (16)
24. Discuss briefly the details of a two wheeler frame. (16)
25. Explain integral and semi integral type vehicle body construction. (16)

UNIT 2

PART - A

Two Marks Questions (Part A questions)

1. What is gasoline injection?
2. What is conventional ignition system?
3. Define common rail ignition system..
4. What is unit injection system?

5. What is a rotary distributor?
6. What are the functions of a spark plug?
7. Write is Electronic ignition system?
8. What are the functions of Turbo chargers?
9. Why the Engine emissions to be controlled?
10. What are the advantages of petrol injection?
11. What is super charging?
12. What are the pollutants emitted by an automobile?

16 Marks Questions (Part B Questions)

13. Explain the working principle of electronic ignition system (16)
14. Discuss the merits and demerits of electronic ignition system (16)
15. With a suitable sketch, explain the Electronically controlled gasoline injection system (16)
16. With a neat sketch, explain the Electronically controlled diesel injection system. (16)
17. Explain the turbo charging system with neat sketch. (16)
18. What is 3 way catalytic converter? Explain its working principle (16)
19. Explain common rail direct injection system with neat sketch. (16)
20. Explain the Unit injector system with neat sketch. (16)

UNIT 3

PART - A

Two Marks Questions (Part A questions)

1. State the functions of clutch.
2. What is the function of pressure plate in a clutch?
3. What are the different types of clutches?
4. Write the main function of gear box.
5. What are the functions of universal joint?
6. State the function of differential unit.
7. What is meant by differential lock?
8. What is a fluid coupling?
9. State the functions of slip joint.
10. What is the function of a propeller shaft?
11. What are the requirements of an automotive transmission?
12. What are the requirements of a clutch?
13. What are the types of gear box?
14. What is the use of torque converter?
15. State the forces act on the rear axle.

16 Marks Questions (Part B Questions)

16. (i) Explain the working principle of torque tube drive with neat sketch. (8)
(ii) Explain the working principle of hotch kiss drive with neat sketch. (8)

17. Explain the construction and working principle of a typical gear box. (16)
18. (i) What is a clutch? Explain the operation of centrifugal clutch. (8)
(ii) Explain the working principle of synchromesh gear box with neat sketch. (8)
19. (i) Explain the types of rear axles with neat sketch. (12)
(ii) What is the necessity of a gear box? (4)
20. Explain the working principle of fluid flywheel with neat sketch and also mention the limitations. (16)
21. Explain the single plate clutch and multiplate clutch with neat sketch. (16)
22. (i) Explain the working of sliding mesh gear box with neat sketch. (10)
(ii) Explain the working of a cone clutch. (6)
23. (i) Explain the working of a constant mesh gear box. (8)
(ii) Explain the working of universal joint with neat sketch. (8)
24. (i) Explain the working of epicyclic gear box with neat sketch. (8)
(ii) Compare fluid coupling and torque convertor. (8)
25. Explain the construction and working of a differential unit with neat sketch. (16)
26. Explain the principle of working of torque convertor with neat sketch. (16)

UNIT 4

PART - A

Two Marks Questions (Part A questions)

1. Define wheel track and wheel base.
2. Give a brief note on damper.
3. Distinguish between disc brake with drum brake.
4. What is meant by bleeding of brakes?
5. Define steering gear.
6. What are the four types of wheels?
7. What is the purpose of Toe-in and Toe-out?
8. What are the different types of tyres used in automobile?
9. What are the different types of springs used in suspension system?
10. Define king pin inclination.
11. Give the function of tyre?
12. Define caster and camber.
13. What are the benefits of anti-lock brake system?

16 Marks Questions (Part B Questions)

14. (i) Sketch and explain various steering geometries. (8)
(ii) Explain with the help of simple diagram the different types of stub axles. (8)
15. Explain the working principles of hydraulic brake with neat sketch. (16)
- 16 (i) Explain a typical power steering system. (8)
(ii) Explain the wheel alignment system. (8)
17. (i) Explain any one type of steering gear box with neat sketch. (12)
(ii) What is the necessity of a steering gear? (4)
18. Explain the steering geometry with neat sketch. (16)

- 19 Explain the working of power steering with neat sketch. (16)
20. (i) Explain the Ackerman principle of steering with neat sketch. (10)
(ii) Explain the working of torsion bar with neat sketch. (6)
- 21 (i) Explain the working of rear independent suspension system with neat sketch. (8)
(ii) Explain the working of front independent suspension system with neat sketch. (8)
22. (i) Explain the working of shock absorber with neat sketch. (8)
(ii) What are the objectives and components of suspension system. (8)
23. Explain the mechanical brakes with neat sketch. (16)
24. Explain the pneumatic or air brakes with neat sketch. (16)

UNIT 5

PART - A

Two Marks Questions (Part A questions)

1. List the advantages of hydrogen fuel used in automobiles.
2. What is a hybrid vehicle?
3. What is a fuel cell?
4. Write the composition of LPG and CNG.
5. Define detonation and pre-ignition.
6. What is the need for CNG?
7. What are the advantages of an electric car?
8. What are the advantages of hybrid system?
9. State the advantages of fuel cell.
10. What are the types of fuel cell?

16 Marks Questions (Part B Questions)

11. How bio diesel is produced? Explain and its usage in automobiles. (16)
12. Explain the operation of hydrogen fueled vehicle with neat sketch. (16)
13. Explain the working principle of fuel cell with neat sketch. (16)
14. Discuss the operation of an LPG propelled vehicle with neat sketch. (16)
15. Explain the concept of hybrid vehicles with neat sketch. (16)
16. (i) Explain the usage of gasohol fuel in automobiles. (8)
(ii) Explain the working of an electric car. (8)