WINTER– 16 EXAMINATION

Model Answer

Subject Code: 17526

Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgment on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

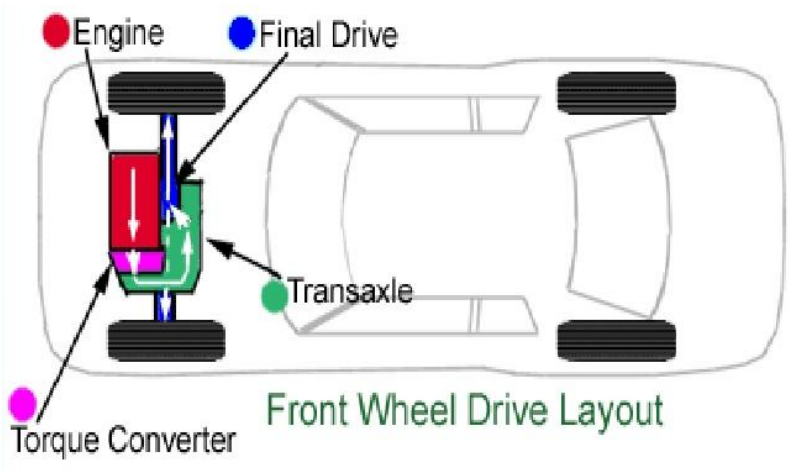
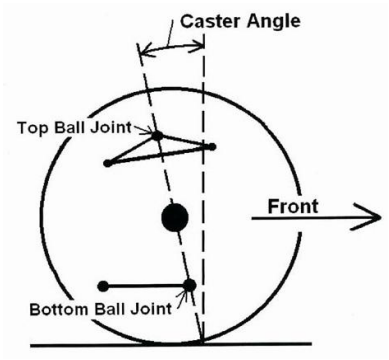
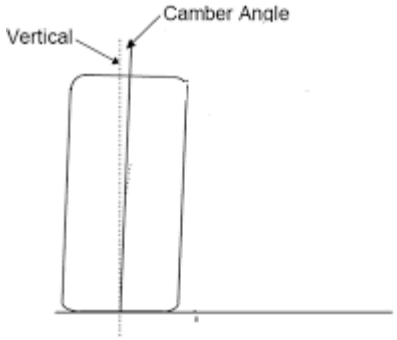
Q. No.	Sub Q. N.	Answer	Marking Scheme
1	A	Attempt any three of the following	
	a)	Write functions of universal joint and slip joint.	
		Answer: **Function of Universal Joint-** Universal joint allows transmission of power and rotary motion at an angle which varies as a vehicle encounters a bump. **Function of Slip Joint-** This joint allows variation in length of the propeller shaft when vehicle came across road irregularities.	2 2
	b)	Draw a neat sketch of front engine front wheel type vehicle layout and label.	
		Answer: **(Sketch - 2 Marks, Explanation – 2 Marks)** 	2

		Fig. Front Engine Front Wheel Drive Front Engine Front Wheel Drive Vehicle: - In this arrangement the engine is fitted in the front of vehicle and drive is given to the front wheel. - The propeller shaft length is reduced or neglects the propeller shaft. - The drive is transferred from engine, situated at front end, to the gear box to the differential with the help of gear drive. The differential unit is placed in the front axle. - This arrangement provides good grip with road surface due to engine weight at the front. - Absence of propeller shaft can decrease the chassis height. NOTE THAT FOR FRONT ENGINE,FRONT WHEEL DRIVE VEHICLE THERE IS GENERALLY NO PROPELLER SHAFT IN MODERN VEHICLES.BUT THERE IS A TRANS AXLE WITH TWO HALF SHAFTS /AXLES ON EACH SIDE CONNECTING WHEELS WITH BALL JOUNTS.	2
	c)	Define and give the range of angles (i)Castor, (ii) Camber	
		Answer: **(i) Castor:** It is the angle between king pin Centre line and the vertical, in plane of wheel **OR** It is forward or backward tilt of the wheel from true vertical when viewed from the side of wheel.  **Range (Amount):** About 3 degree of castor gives good results. **(ii) Camber:** It is the tilt of car wheels from the vertical when viewed from the front of vehicle.  **Range (Amount):** Camber should not exceed 2 degree.	1 1 1 1

	d)	State necessity of braking system. What is function of parking brakes?	
		Answer: (**Necessity-2marks**, **Functions- 2marks)** **Necessity of Braking System:** In an automobile, if the pressure from accelerator pedal is removed, the vehicle tends to slow up because of wind resistance, drag of engine and road friction. These forces, of course, would stop the vehicle but in present day traffic, this would be quite unpredictable and dangerous. The braking system provides added friction to overcome motion and to slow up or to stop the vehicle. The momentum or kinetic energy developed by the vehicle when in motion is converted to heat energy by the friction of brake shoes and drums which is dissipated into the surrounding air. Therefore the braking system is necessary to stop the vehicle or to retard the speed of vehicle within shortest interval of time with safety. **Function of a parking brakes:** 1) To assist drivers in downhill braking. 2) To make sure that the vehicle doesn't move while parked.	2 2
	B	Attempt any one of the following.	
	a)	Explain working of petrol engine power plant with neat sketch.	
		Answer: **(3 marks for working of TWO or FOUR stroke petrol engine & 3 marks for sketch)** The petrol engine uses petrol for its running. Petrol or gasoline is a hydrocarbon, made up of hydrogen and carbon compounds. Air-petrol mixture is sucked into the cylinder during the suction stroke of the piston. The correct air- petrol mixture is compressed during the compression stroke, ignited during the power stroke and the exhaust gases pushed out during the exhaust at the top of cylinder which gives spark to ignite the mixture. **Working of TWO stroke Petrol engine** : The air fuel mixture from the carburetor enters the crank case through the inlet port during the upward movement of piston. At the same time the mixture in the cylinder is compressed which is ignited when the piston is just at T.D.C. the combustion takes place and the piston moves imparting motion to the crank shaft. During the downward movement of the piston the mixture in the crank shaft is compressed and pushed into the cylinder through the transfer port which pushes out the exhaust gases through the exhaust port, at the same time filling the cylinder with a new charge. This process is called cross-flow scavenging. Thus whole cycle is completed in two strokes i.e. one revolution of crankshaft.	03

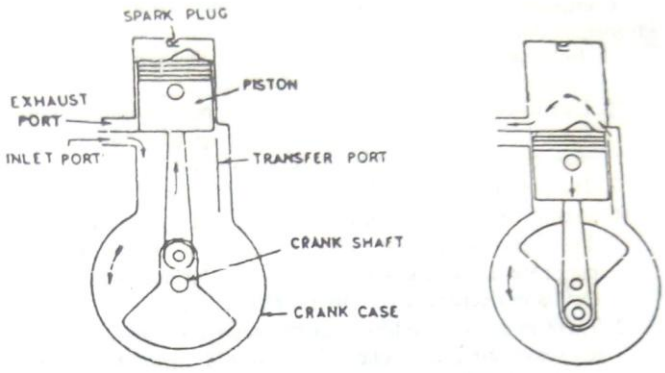


Fig. Two Stroke Petrol Engine.

OR

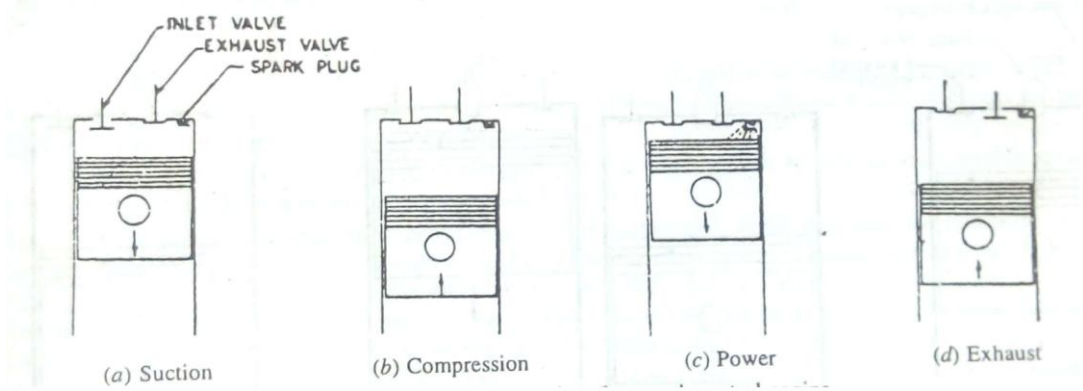
Working of FOUR stroke Petrol engine :

The cycle of events that takes place in 4 stroke petrol engine is shown in figure. Fig. (a) shows the suction of air-fuel mixture in the cylinder during the downward movement of the piston. The piston moving away from cylinder head creates a pressure reduction or below atmospheric pressure. This depression is responsible for sucking the air-fuel mixture in the cylinder in naturally aspirated engine.

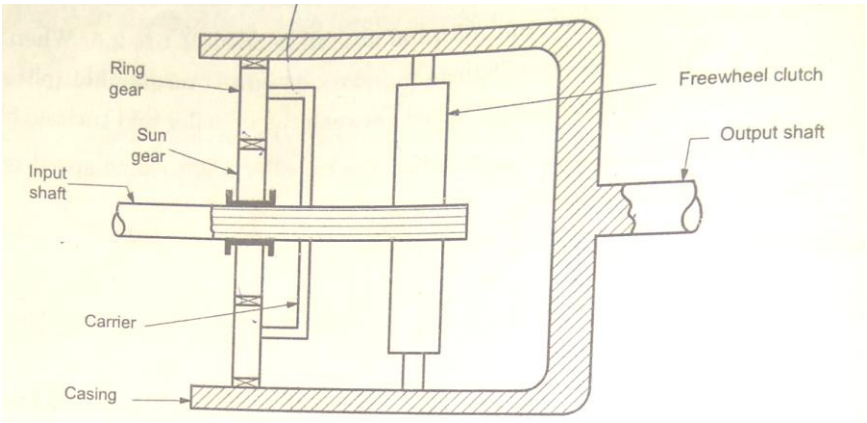
In fig. (b) is shown the compression stroke in which both the inlet and exhaust valves are closed at the end of which the typical cylinder pressure will be from 8 bar to 13 bar with engine running under load. Towards the end of the compression stroke, combustion of the charge is ignited by the spark plug occurs. This generate the heat and rises pressure. The burning gases expands as shown in fig (c) pushing the piston downward. This is called the power or expansion stroke. 03

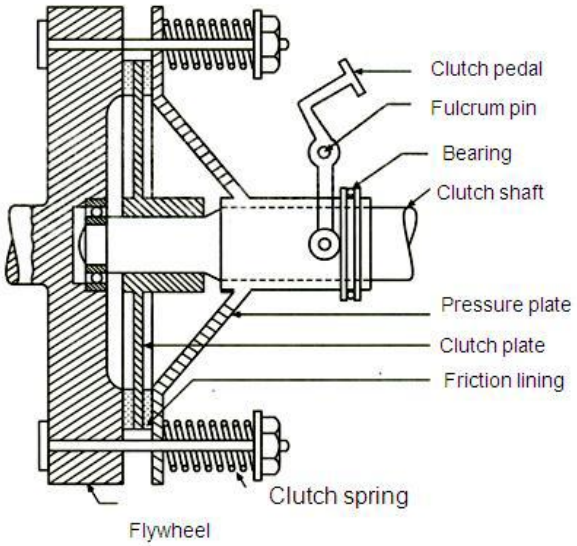
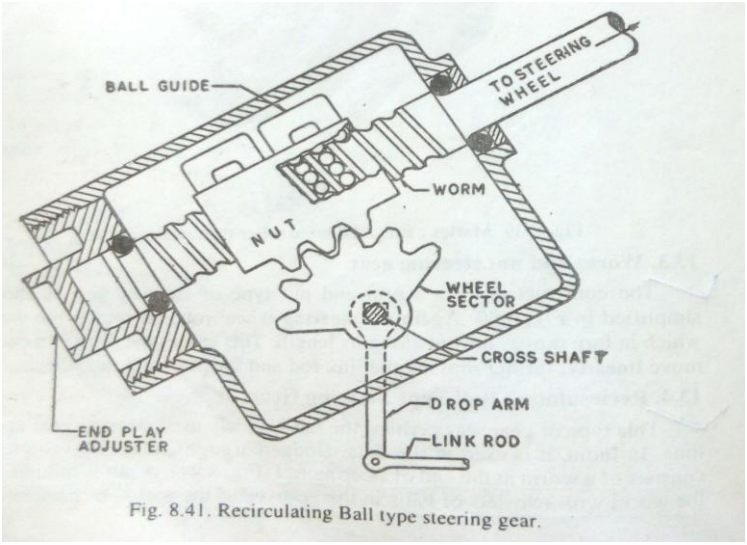
At the end of power stroke the inlet valve remains closed but exhaust valve opens, the piston moves towards the cylinder head expelling most of the burnt gases to atmosphere (fig. d).

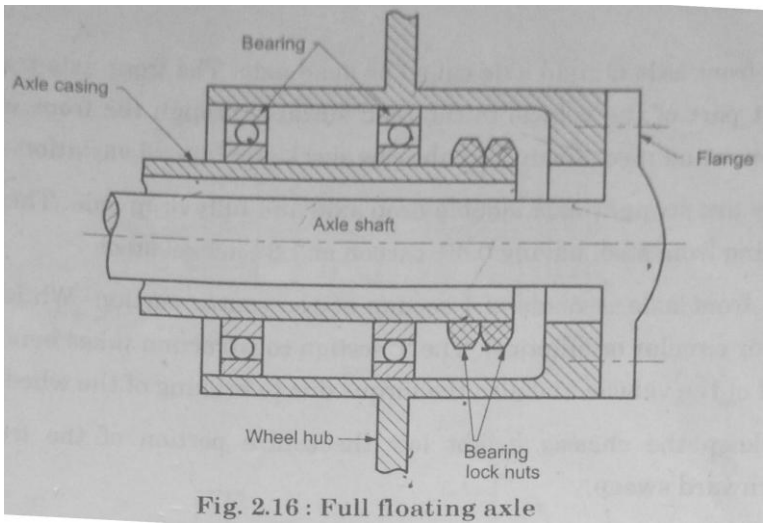
Thus whole cycle is completed in four strokes i.e. two revolution of crankshaft.

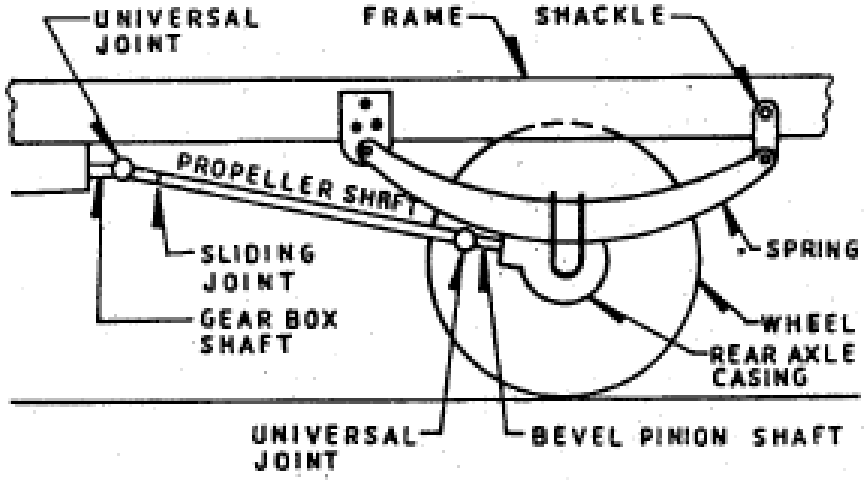


03

		Fig. Four Store Petrol Engine	
	b)	Describe the working of overdrive with neat sketch	
		Answer: Working of Overdrive:  **Figure - Overdrive** It consists of an Epicyclic gear train in which sun gear is free to rotate on the engine shaft (input shaft) which is splined while the carrier can be slide. A free clutch is also fitted on input shaft. The ring gear is mesh with the casing of the output shaft. - When the sun gear is locked with the casing i.e. it became stationary, the speed of the output shaft increase hence says as overdrive is engaged. - When the sun gear is locked with the carrier or ring gear, solid drive through the gear train is obtained. - Thus depending upon the locking of sun gear with casing or carrier the overdrive or direct drive is obtained. - Thus depending upon the locking the sun gear with casing or carrier the overdrive or direct drive is obtained. - There is another possible control of mechanism there is a direct drive through the free wheel clutch when engine develops the power. - When accelerator pedal is brought to zero position and engine is idling, the output shaft will tends to override the input shaft. - The rollers of free wheel no longer remain wedge and the vehicle freewheels. - Thus for gear changing driver has to lift his foot off the accelerator pedal, clutch pedal not be operated.	03 03
2		Attempt **any four** of the following	
	a)	State advantages of LPG and CNG operated engine.	
		Answer: Advantages of LPG & CNG operated engines: 1. Low cost of fuel. 2. Less pollution and more efficiency. 3. It is safer for vehicle. The LPG/CNG fuel tank is made of thick wall so they can withstand dynamic explosion, crash test, and direct gunfire. 4. Increased life of lubricating oils, as LPG/CNG does not contaminate and dilute the crankcase	1 marks for each (any four) .

		oil. No need of oil change frequently which reduce vehicle maintenance. 5. Due to its antilock property, CNG can be used safely in engine with compression ratio as high as 12:1 compare to gasoline engine. Because CNG has a higher octane number than petrol, CNG engines operate at higher compression ratio without knocking. 6. CNG/LPG fuel systems are sealed, preventing fuel losses from spills or evaporation.	
	b)	Draw a neat labeled sketch of single plate clutch	
		Answer: *(Note: Correct labeled sketch – 4 marks)*  Fig. Single Plate Clutch	04
	c)	Describe with sketch working of Re-circulating ball type steering gear box	
		Answer:  Fig. 8.41. Recirculating Ball type steering gear. **Working of Recirculating type steering gear box**: It consists of worm at the end of steering rod. A nut is mounted on the worm with two sets of balls in the grooves of the worm, in between the nut and worm. The balls reduce the friction during the movement of nut on the worm. the nut has large number of teeth on the outside, which mesh with the teeth on a worm wheel sector, on which is further mounted the drop arm, which steers the road wheels through the link rod and steering arm. When the steering wheel is turned, the balls in the worm roll in the grooves and cause the nut	02 02

		to travel along the length of the worm. The balls , which are in Two sets are recirculated through the guides as shown in the fig. the movement of the nut causes the wheel sector to turn at an angle and actual the link rod through the drop arm, resulting in the desired steering of the wheels.	
	d)	Describe with neat sketch working of Rear Axle used in Truck.	
		Answer: Full Floating Rear Axle:  Fig. 2.16 : Full floating axle - In this type of axle two taper roller bearings are used. Bearings are placed between the axle housing and the wheel hub. Since the load of the vehicle is supported completely by the axle housing. - The axle only transmits driving torque. The inner end is supported inside gear of differential and outer end have a flange to which wheel hub is bolted. - The axle may be removed or replace from the housing without disturbing the wheel by removing the nut. This type of axle is more expensive and heavier than other axle. This type is used in trucks or commercial vehicles.	02 02
	e)	Describe with neat sketch Hotch-Kiss drive.	
		Answer: Hotchkiss drive-	02

		 **Hotchkiss drive** **Working of Hotchkiss Drive-** This is the simplest & most widely used. The springs be sides taking weight of the body also take the torque reaction, driving thrust & side thrust. The propeller shaft is provided with two universal joints & also sliding joint. The spring is fixed rigidly in the middle to the rear axle. The front end of the spring is fixed is fixed to the frame by the front half of the springs. Due to torque reaction, the spring deflects as shown in fig. & is taken up by the springs. Similarly to take up the braking torque, the springs would deflect in the opposite direction. When the rear axle moves up & down due to the road condition, it has to move in a circle with the front spring support at the frame as centre. But for the propeller shaft motion, the centre is at the front of the universal joint. This means that during this movement of the rear axle, the length of propeller shaft has to vary. This is provided for by means of a sliding joint in propeller shaft.	02
3	a)	**State the need of differential. Explain with neat sketch working of differential.**	
		Answer: **Need of differential gear box:** When a vehicle travels in straight line, the two rear wheels turn on road exactly at the same speed and there is no relative movement between two rear wheels. But when vehicle takes a turn the outer wheel travels on a longer radius than inner wheel. The outer wheel turns faster than inner wheel i.e. there is relative movement between two rear wheels. If 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. There for there must be some device, which will divide the input torque of transmission system between two rear axles. Differential serves this purpose. **Working of differential gear box:**	**Need 2 marks,**

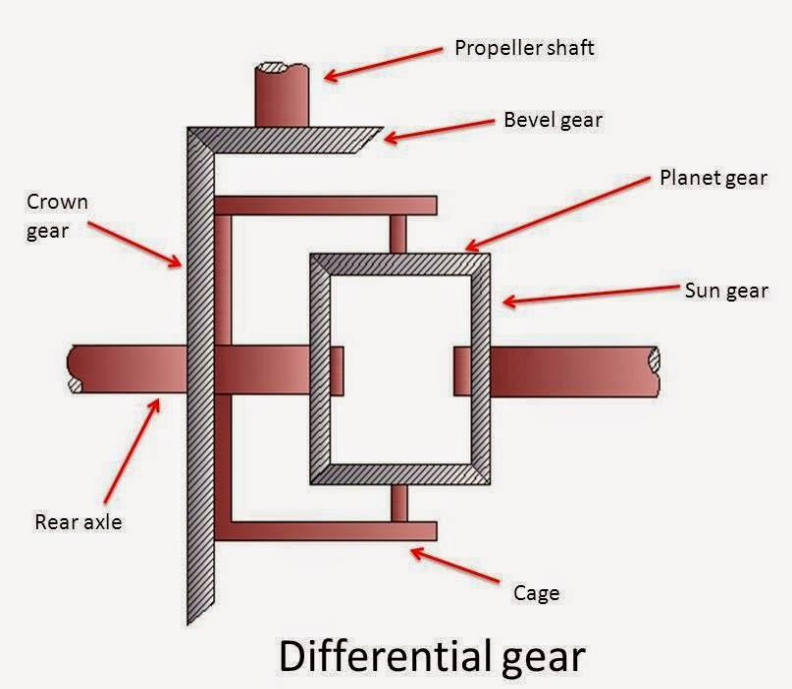


Figure 3marks,

The arrangement differential gear is as shown in figure. The crown wheel is fixed to casing. The i9nner ends of the half shafts pass through the boss of the differential case in which they are rotate. Inside the differential case the shaft carry the bevel sun gear with which bevel pinion mesh. The bevel pinions are free to turn on the pin fixed in the differential case. The differential provides an equal drive to each half shaft, although they may be rotating at different speeds, therefore it allows the outer wheel to rotate faster than inner wheel.

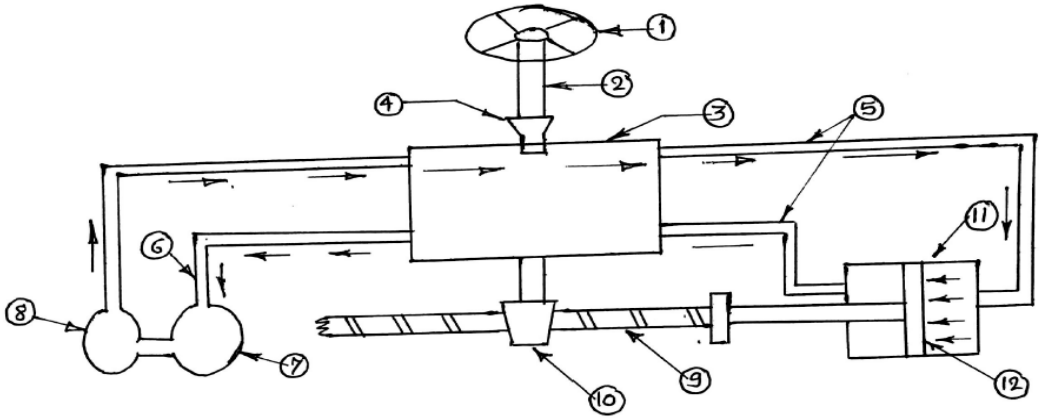
When the vehicle is going straight there is no relative movement among the different gears. The cage and inner gears rotate as a single unit and both half shafts revolve at same speed of N rpm.

But when vehicle is taking turn towards left, at this time there will be resistance to the motion of the left wheel. Due to differential action, the left wheel rotates back at n rpm and right wheel will rotate forward at N rpm as the outer wheel has to cover more distance than inner wheel. Thus resultant speed of right wheel will be (N + n) rpm and left wheel will rotate at (N – n).

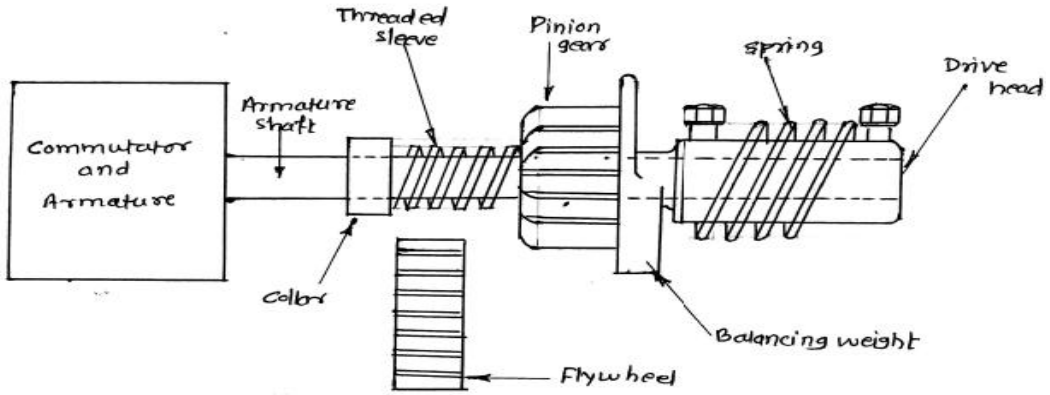
Working 3marks.

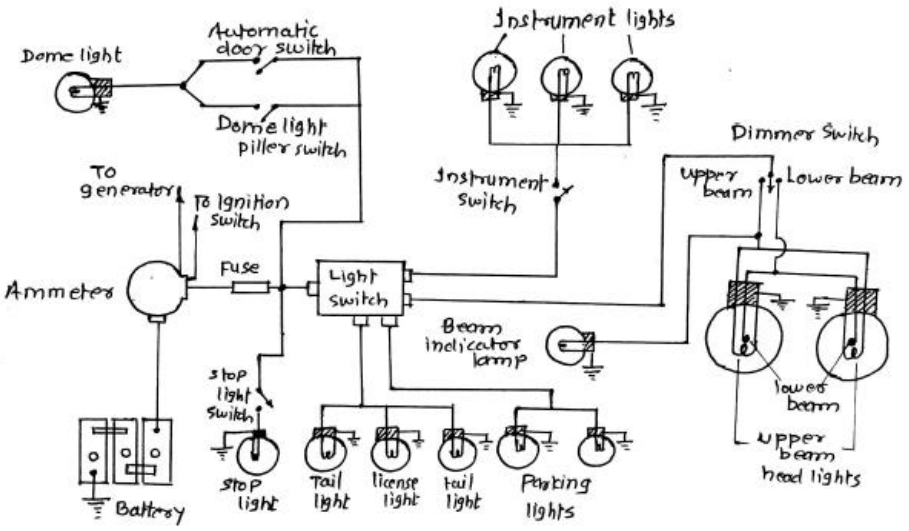
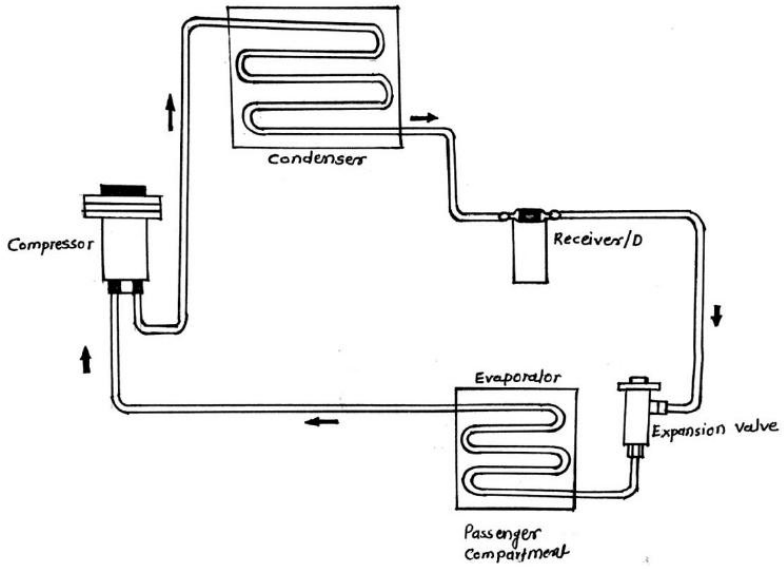
3	B	**Differentiate between drum brake and disc brake (any Eight Points).**	
		Answer:	**1mark for each correct point. Total 08 marks.**

Sr. no	**Drum brake**	**Disk brake**
1	Consists of drum and internal expanding curved shoes.	Consists of disc and float shoes.

		2	Brake pads on shoes are curved in shape.	Brake pads on shoes are of flat shape.	
		3	Pad wear adjusting is not automatic.	Pad wear adjustment is automatic.	
		4	Non-uniform pressure on curved drum surface.	Uniform pressure on disc surface.	
		5	Less stability.	Better stability.	
		6	Less cooling of brakes due to closed design.	Better cooling of brakes.	
		7	More braking effort required.	Less braking effort required.	
		8	Non-uniform wear on brake pad.	Uniform wear on brake pad.	
		9	More weight than disc brake.	Less weight than drum brake.	
		10	Takes time to replace friction pad.	Easy to replace friction pad.	
3	C	**Describe working of power steering with sketch.**			
		 Fig. Power steering -Power steering mechanism employs electrical devices, compressed air & hydraulic pressure. - Two types of power steering (1) integral (2) linkage. - Hydraulic power steering consist of fluid reservoir, hydraulic pump, hydraulic ram		**Diagram -4 marks** **Working - 4marks.**

		with a fixed length piston rod, hydraulic control valve, steering shaft, steering box & steering wheel. - Engine driven hydraulic pump feeds the fluid under pressure from fluid reservoir to the hydraulic feed lines. A hydraulic control valve situated below the steering senses the input pressure at the steering wheel & converts it into pressure changes into the hydraulic ram. - As soon as the driver turns the steering wheel , the steering arm moves the control valve such that one of the ports closes whilst the other open. High pressure fluid from the pump flows to one side of the hydraulic ram piston moves it towards one side. The movement of the piston causes the steering linkage to move in the required direction	
4A	a)	**Explain any four factors affecting tyre life.**	
		Answer: 1. **Inflation pressure**: If tyre is inflated with less pressure, it will cause uneven tread wear, more tyre wear on sides, lack f directional stability ans increased rolling resistance. If tyre is inflated with more tyre pressure, it will reduce the tread contact area which results in more wear in the center of the tread, it also reduces the road grip. 2. **Wheel alignment**: If wheel balancing is not proper uneven load will occur on tyres, again radial and lateral run out will also cause wear of the tyres. 3. **Driving manners**: This includes sudden acceleration, high speeds, sudden braking, driving on bad roads etc. 4. **Tyre maintenance**: This includes tyre rotation at regular intervals (in km) and checking of wheels balance. 5. **Nature of road surface**	**1mark Each correct point, Total 04 marks.**
	b)	**What is the requirement of suspension system in automobiles?**	
		Answer: 1. It should provide comfort. 2. It should provide safeguard to the occupants. 3. It should have high strain energy per unit weight. 4. It should be of minimum weight. 5. It should have low maintenance and low operating cost. 6. It should have minimum tyre wear.	**Any four correct point 1 mark for each, Total 04 marks.**
	c)	**Sketch and explain working of Bendix drive**	

		Answer:  Fig. Bendix Drive -It is a starting device. - Bendix drive is inertia drive. - The starter motor pinion on which unbalanced weight is attached & it is made to engage or disengage with the toothed rings on the periphery of the engine flywheel. - Drive head is keyed to the end of armature shaft. -When current is passed through the starting motor (commutator and armature assembly), the armature shaft starts revolving at full speed. - At the same time pinion travels to the end of thread because of its unbalanced weight. - It strikes the collar at left & forced to turn with the thread sleeve. This causes the flywheel & crankshaft to turn & crank the engine. - Immediately after starting the engine the unbalanced weight pinion returns to its initial position because speed of flywheel is more than speed of unbalanced weight pinion.	**Diagram 02 marks,** **Working 02 Marks**
	d)	**Draw a layout of lighting system of four wheeler.**	

		 fig. Wiring Diagram of four wheeler	**Correct labeled diagram 04 marks.**
4 B	a)	**Explain working of car air conditioning system with layout.**  Fig:- Layout of car air conditioning system.	
		Working of car air conditioning system. - The layout of car air conditioning system is shown in figure. - The main components of the system are compressor, condenser, receiver/dryer, expansion valve and evaporator. - In this system the heat is absorbed and transferred in the following steps.	**03 marks for layout, 03 marks for explanation.**

		i. Refrigerant leaves the compressor as high pressure vapour. ii. By removing heat via condenser, the vapour becomes low temperature liquid. iii. Moisture and contaminants are removed by the receiver dryer, where the clean refrigerant is stored until it is needed. The expansion valve controls the flow of refrigerant into the evaporator. v. Heat is absorbed from the air inside the passenger compartment by the low pressure, refrigerant, causing the liquid to vaporize and greatly decreased passenger compartment temperature. vi. The refrigerant returns to the compressor as a low pressure, low temperature vapours and a cycle completed.	
	b) i.	**State precautions to be taken while using air conditioning system of a vehicle.** **(Eight Points)**	
		Answer: -Operate the air conditioner periodically or at least once a week to keep the internal parts lubricated as well as prevent the hoses from hardening. - Do not switch ON the A.C. at high speeds which may result in the ceasing of compressor. - Do not stick anything into the air outlet or the air inlet. As it dangerous and it can cause injury or damage. - Avoid exposing a body directly to a continuous cool air flow for long periods- It is not good for health. - Avoid placing any obstacles near the inlet or outlet- if inlet or outlet is blocked it may causes damage to the unit. - Do not run or stop the unit frequently. If run or stop the unit more than 4-5 times an hour, it may cause damage to the unit. - The air filter should be cleared at least once every two weeks. - When the unit is cleaned, set the selector switch at off position. - Never operate A.C. with heater on. - Do not charge the refrigerant in the A.C. system before flushing.	**Each point ½ marks, total 04 marks.**
	ii	**Why modern cars use R134a refrigerants instead of R-12?**	
		Answer: -Refrigerant R134a is a hydro fluorocarbon (HFC) that has zero potential to cause the depletion of the ozone layer and very little greenhouse effect.	**01 Mark for each reason**

- R134a is the non-flammable and non-explosive, has toxicity within limits and good chemical stability.
- It has somewhat high affinity for the moisture.
- The overall physical and thermodynamic properties of refrigerant R134a closely resemble with that of refrigerant R12.
- Due to all the above factors, R134a is considered to be an excellent replacement for R12 refrigerant.

5 Attempt any FOUR of the following:

a) Write different type of wire colour codes used in automobile wiring.

Answer: (04 Marks for Listing four color codes with their function)

01 Mark Each

Sr. No	Colour	Colour code	Function
1	Brown	**BR**	Battery Circuit
2	Yellow	**Y**	Generator Circuit
3	White	**W**	Ignition Circuit
4	Green	**G**	Auxiliary Circuit
5	Blue	**BL**	Headlamps Circuit
6	Red	**R**	Side & Tail Lamp Circuit
7	Black	**B**	Earthed Circuit

b Describe disc wheel with neat sketch

(Description-02 marks, Correct labelled dia-02 marks)

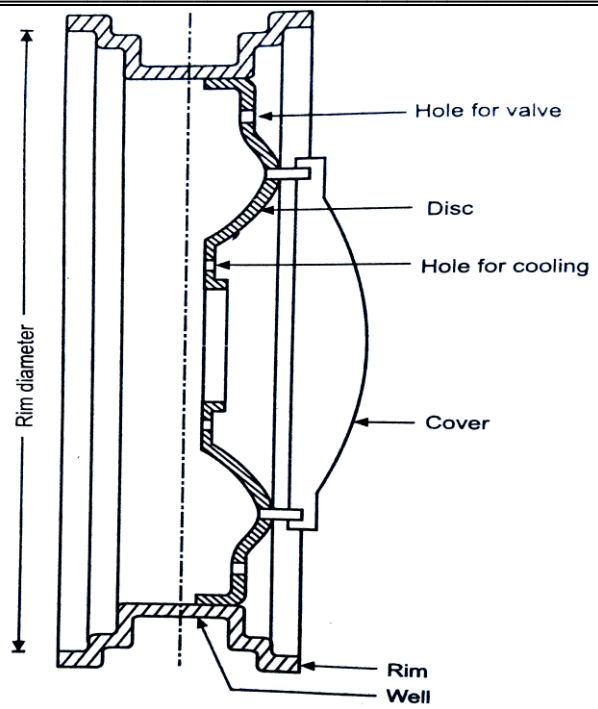
02 Marks

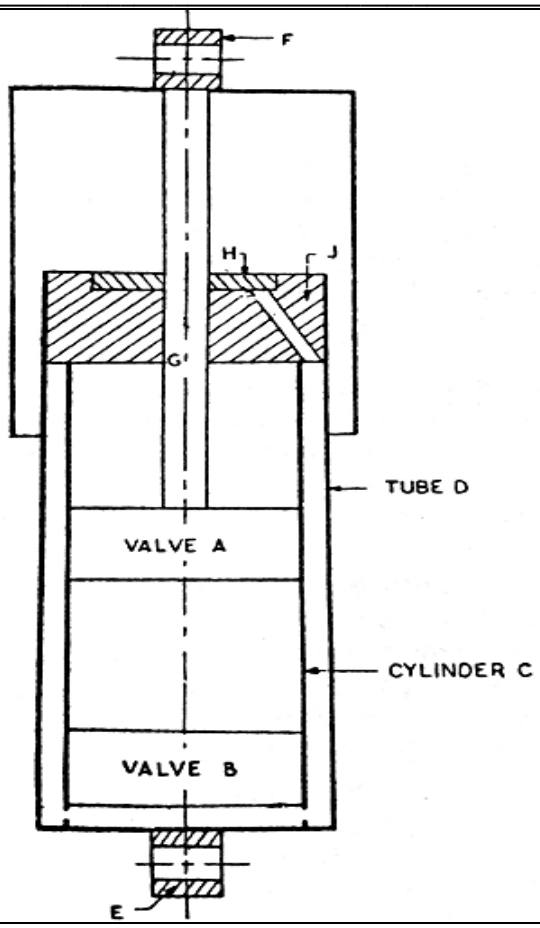
Answer: Disc wheel (pressed steel) consist of two parts, a steel rim that is generally, well based to receive the tyre and pressed steel disc. The rim and disc may be integral, permanently attached or attachable. A typical steel disc wheel is shown in the figure.
When the bead of tyre is resting in the well, it is possible to pass the tyre over the opposite edge of the rim.

The steel disc performs the function of spokes. The wheel is fitted on the axle by bolting to the flange attached to the latter. Some slots are generally provided in the wheel to allow air to pass the inner side for a better cooling effect of brake drum. Since these holes bends to weaken the disc, the hole in modern wheel are swaged, which means that some portion of disc around each hole is turned inward smoothly?

A wheel may be inset, zero set or offset, depending upon the position of rim in relation to the attachment face of the disc. In the zero set wheels, centerline of the wheel coincides with centerline of rim. In case of inset wheel center line of rim is located inboard and for offset wheel center line of wheel is located outboard.

02

			
	C	**Describe telescopic shock absorber with sketch**	
		Answer: Working of Telescopic Shock Absorber: Below figure shows a simple Telescopic Shock absorber. There is a fluid in space above valve assembly (A), below (A) & also in annular space between cylinder (C) & tube (D), which is connected to the space below valve assembly (B). (H) is gland in head (J) & any fluid scrapped off by rod (G) is brought down into annular space through inclined passage shown in head. Eye (E) is connected to axle, while eye (F) is attached to chassis frame. Fluid generally used in shock absorbers is a mixture of 60 per cent Transformer oil & 40 per cent Turbine oil. When car has come across a bump**,** Eye (E) would move up & thereby the fluid will pass from lower side of valve assembly (A) to its upper side. Due to pressure of fluid through rod (G) fluid will be go to underside of valve (B). This passing of fluid through valve openings provides damping. Similarly for downward motion of eye (E), fluid will pass upper side of valve assembly (A) to lower side & also from lower side of valve assembly (B) to its upper side.	02

			02
	d)	**Why Aerodynamic shapes is important in Automobile bodies? State it's advantages**	
		(Description with sketch-2 marks, advantage any two points-2marks) **Answer:** **Importance of aerodynamic shape in Automobile body of car:** The body of vehicle is designed to protect the passenger as well as various components of the vehicle from the air. An aerodynamic shape of car body is the external shape of car body which will offer least resistance to air motion. Whenever car is moving there is an air resistance to motion of car. This air resistance depends on (i) Size of car (ii) frontal shape and area (iii) speed and (iv) wind velocity. This air resistance is given by $$Ra = Ca.\rho.A.V^2$$ Where, Ra - Air Resistance, Ca - coefficient of air resistance and V= Velocity of vehicle (speed) ρ – Density of air Now as frontal projected area of vehicle increases then vehicle air resistance increases & vice-versa.	02

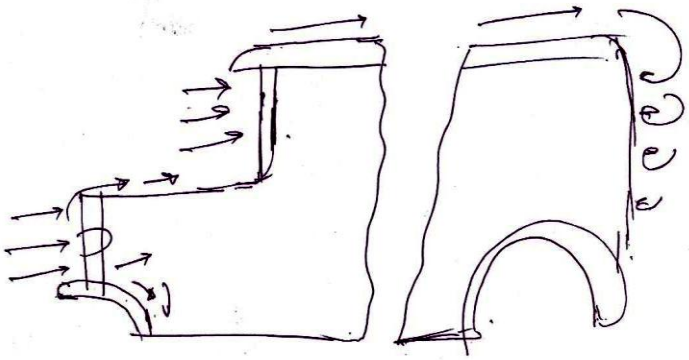


Figure No.1

Figure 1. Indicates frontal area of vehicle which is vertical, flat & offers more air resistance also flat portion at the rear produces drag which pulls the vehicle back reducing the motion of the vehicle.

So frontal area of car & body of car is designed in such a way that front portion is made inclined & body is given smooth curves (using curves instead of flat surfaces). This offers a least resistance to air & called as an aerodynamic shape.

Figure 2.indicates the use of curved surfaces in modern vehicles instead of flat surfaces .This offers less air resistance.

Aerodynamic body shape of Improves,

- There is least air motion resistance due to the aerodynamic shape.
- Engine load is decreased and there is better fuel efficiency & average.
- Air eddies are not formed.

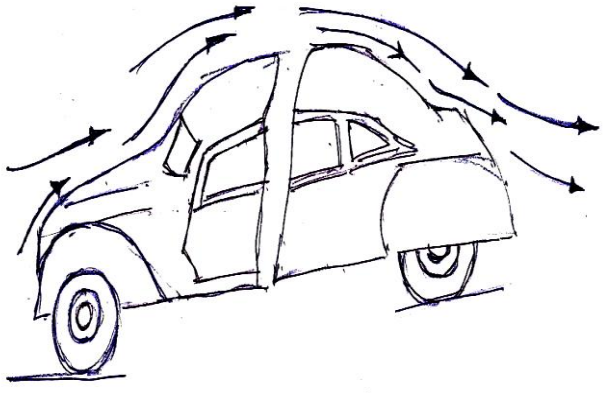


Figure No.2

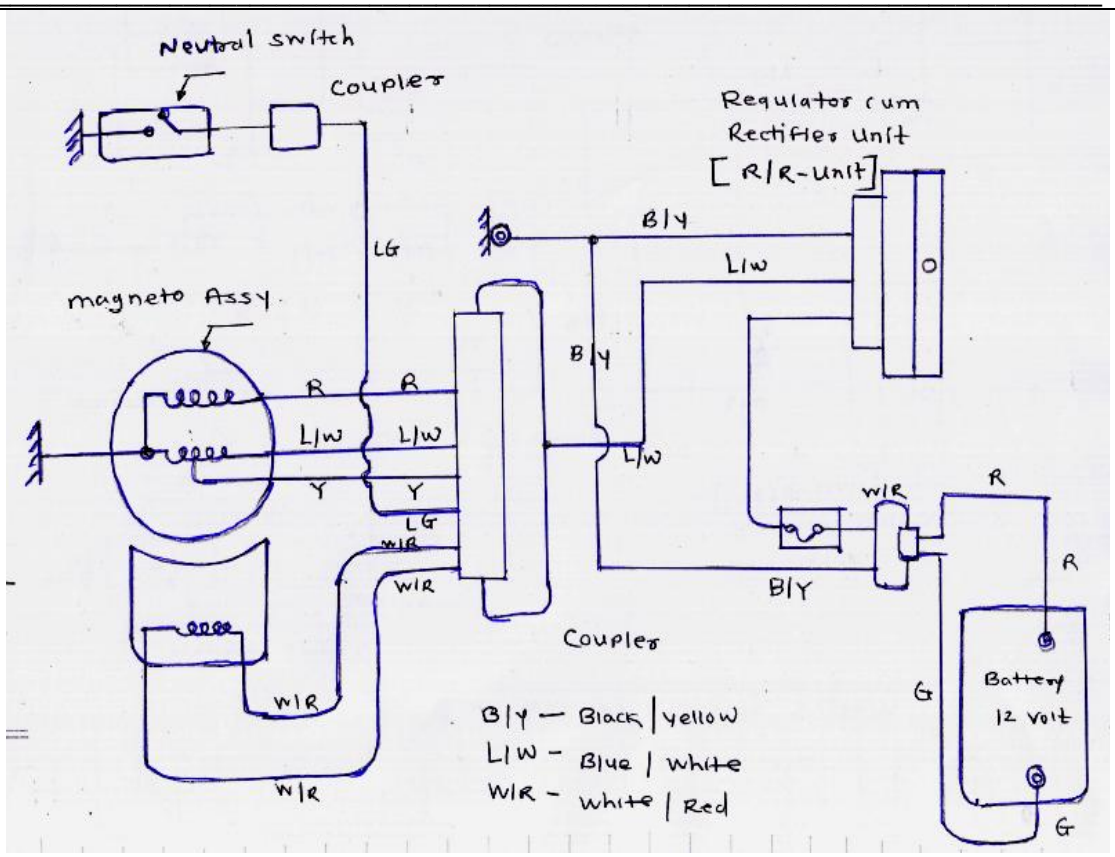
Advantages of Aerodynamic Shape of Body:

[1] Reduce Air resistance or air drag.
[2] Reduce driver effort to drive vehicle.
[3] Improve speed of vehicle.
[4] Provide better fuel economy through reducing fuel consumption.
[5] Provide attractive shapes and better aesthetic appearance to the vehicle.
[6] Reduce noise pollution.
[7] Reduce running cost of vehicle.

01 MarkEach

	e	**How Automobiles are classified?**	
		Answer: *(Any four purpose – 1 mark each)* **1. According to Purpose (Use)** a) Passenger Cars b) Goods Carriage c) Special Purpose d) Earth Moving e) Motor Cycle (Bikes) f) Mopeds **2. According to Fuel Used:** a) Petrol Vehicles b) Diesel Vehicles c) LPG/CNG Vehicles d) Electric Cars e) Hybrid Cars f) Solar Cars g) Fuel Cell **3. According to Load Carrying Capacity:** a) Heavy Motor Vehicle b) Medium Motor Vehicle c) Light Motor Vehicle **4. According to Drive Used:** a) Left and Right Hand Drive b) Two Wheel and Four Wheel Drive **5. According to Engine Location and Mounting:** a) Front Engine Front Wheel Drive b) Rear Engine Rear Wheel Drive c) Front Engine Rear Wheel Drive d) Bus Chassis e) Full Forward Chassis f) Semi Forward Chassis **6. According to Body Styles:** **A. Passenger Cars:** **a)** Sedan/Saloon **b)** Hardtop **c)** Lift back (Hatchback) **d)** Station Wagon **e)** Coupe **f)** Limousine **g)** Convertible **h)** Estate Car	**01 MarkEach**

		B. Heavy Vehicles/Trucks: a) Truck Punjab Body b) Truck Half Body c) Truck Platform Type d) Truck with Trailer e) Dumper f) Tanke **7. According to Wheel and Axle:** a) Two and Three Wheeler b) Four Wheeler and Six Wheeler c) Single and Multi-Axle	
6		**Attempt any <u>TWO</u> of the following:**	
	a)	**State the need of charging system. Describe construction and operation of charging system used in automobiles**	
		(Need-2, construction-2, working-2, Any appropriate figure-2) **Answer: Need of charging system**: - The battery is storage of direct current. The battery has to supply the current to the starter at the time of starting as well as to the various accessories of automobile. Due to prolonged use the charge of battery is decreased. Therefore to keep the battery always in charged condition there is a need of charging system. **Construction**: Charging system is a part of a overall electrical system of motor vehicle which ensures that battery remains in charged state in any given situation. It comprises of following: - 1) Battery- Gets charged as it avails DC supply from rectifier 2) Rectifier- It is full wave three phase rectifier that is used in every vehicle 3) Regulator- It regulates current and voltage to the battery by regulating field current 4) Alternator- Stator and rotor – Converts mechanical energy made available by engine into electrical energy as per the principle of induction. 5) Relevant Electric circuit **Operation**: - When the Ignition switch is turned on, the rotor receives the current from the battery through the voltage regulator. This current energizes the rotor field magnet, which induce a current in the stator windings as the rotor is turned by the pulley. The induced alternating current is changed to direct current by the rectifier. When rotor speed increases, the DC voltage of the alternator increases as the battery gains in charge. To limit the generator voltage a voltage regulator is used.	



Charging system of two wheeler

b) **Explain with neat sketch electronic ignition system**

(Construction-2, Working-3, sketch-2)

Answer: Electronics Ignition system is similar to conventional point type Ignition System with a small difference. Electronics Ignition system is provided with Electronic control unit which opens and close the primary circuit instead of contact breaker point as in Contact breaker point ignition system.

Construction: Electronics Ignition system is having two circuits Primary and Secondary circuit. Battery, primary winding, ECU and the timer forms primary circuit. Whereas secondary winding, distributor and spark plug forms secondary circuit. A timer is employed in the distributor instead of contact breaker. This timer may be Pulse generator or Hall- effect switch which Triggers the Ignition module also called as electronic control unit.

Working: this control unit primarily contains transistor circuit whose current is triggered off and on by timer which results in the stopping and starting of the primary circuit. The secondary circuit worked in the similar manner as in conventional contact breaker type. i.e. when the magnetic field collapses it induces current in the secondary winding having more number of turns. This results in development of very high voltage necessary to generate the spark at the spark plug.

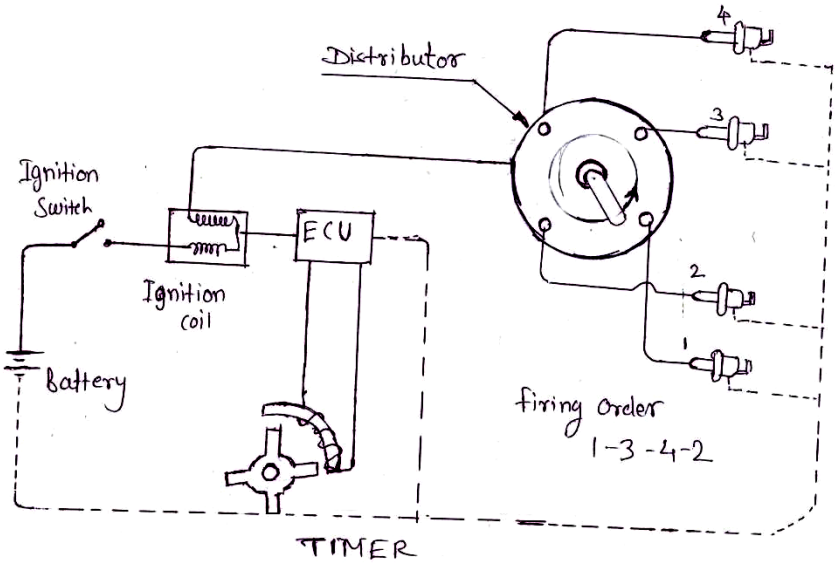


Figure- Electronic ignition system

c) **Describe construction of Wishbone type suspension system. State it's advantage**

Answer: (Sketch: 03 , Construction:03 Advantage:02)
(Note: Equivalent credit shall be given to any other suitable sketch if drawn)

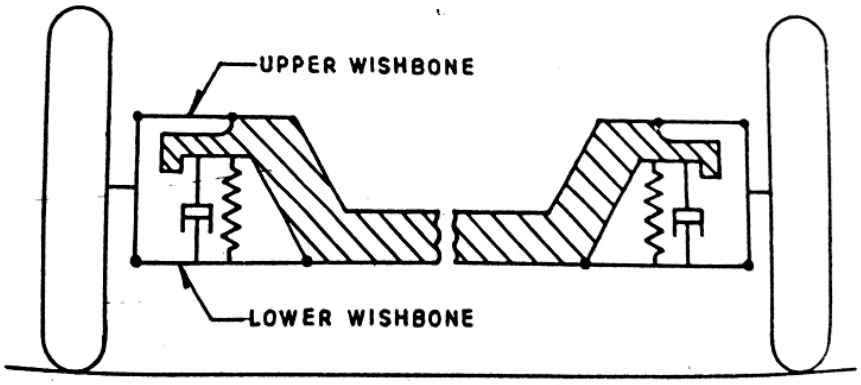


Fig: Wishbone type suspension (Schematic)

Construction: It consists of upper and the lower wishbone arms provided to the frame. These arms resemble letter 'A'. The spring is placed in between the lower wishbone and the underside of the cross member. The vehicle weight is transmitted from the body and the cross member to the coil spring through which it goes to the lower wishbone member. A shock absorber is placed inside the coil spring and is attached to the cross member and to lower wishbone member.

Advantages of Wishbone type suspension system. : (Any two points)

1) In this type wheel track is constant, so it avoid tyre scrub, reduces tyre wear.

		2) Right and left side suspension of vehicle is independent, so vehicle is stable on uneven surface or on the pot hole or digs. 3) Because of V shape of arm, the wishbone not only positions the wheels and transmits the vehicle load to the spring, but also resists acceleration, braking and side forces. 4) It requires less vertical space compared to mac-pherson, so less ground clearance & better vehicle stability.	