



MODEL ANSWER

SUMMER– 17 EXAMINATION

Subject Title: TWO WHEELER TECHNOLOGY

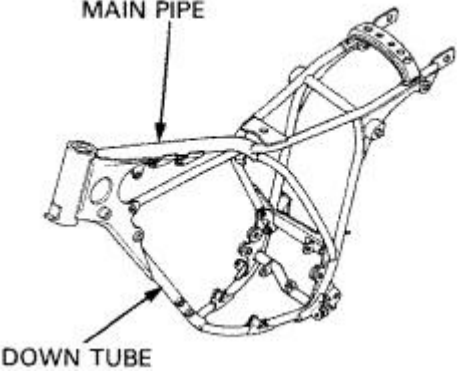
Subject Code:

17521

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 judgement 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		Attempt any FIVE of the following	20
1	a)	Describe Monocoque construction of the two wheeler body.	04
		<p>Answer:</p> <p>Monocoque is a one-piece structure which defines overall shape of the two wheeler body while ladder, tabular provide only stress members. Today 99% two wheeler body produced in this planet are made of steel Monocoque chassis. Chassis are made by welding of several pieces. (Spot winding). Monocoque is made of steel.</p> <p>Spot-winding of monocoque construction</p> <p>Two plates are connected by resistance to electric current flow & work piece are held together under pressure exerted by electrodes. The spot welded together by robot arm in stream production line.</p> <p>This monocoque construction has Space-efficiency (the whole structure is actually an outer shell.) Monocoque chassis has benefits of crash production because it uses a lot of metal. It is cheap for mass production.</p> <p>This construction is very heavy. And this construction is impossible for small volume production.</p>	03

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1	b)	Explain vacuum operated fuel supply system.	04
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Answer: This system is based upon the simple fact that the engine suction can be based for sucking fuel from the main tank to the auxiliary fuel tank from where it flows by gravity to the carburetor float chamber.

In this system the fuel tank is placed below the level of the carburetor. The fuel from the tank is sucked by a separate unit (auto-vac) with the assistance of the inlet manifold vacuum. Then the fuel is fed to the carburetor by gravity.

The pump feed system is shown in the figure above. In this system, a steel pipe carries the fuel to the fuel pump which pumps it into the float chamber of the carburetor through a flexible pipe. If the fuel pump is mechanical, it has to be driven from the engine camshaft and hence placed on the engine itself. However electrically operated pump can be placed anywhere. It is mostly located at the rear in the fuel tank reducing the tendency of forming vapour lock. The system provides the fuel requirement at various engine speeds efficiently.

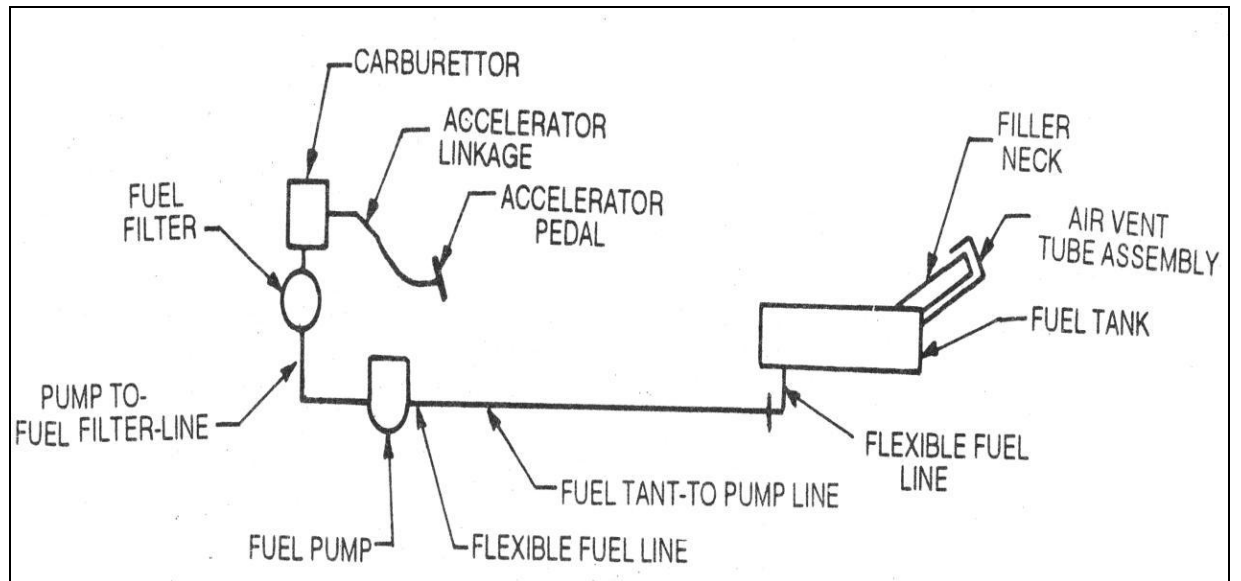


Figure: Vacuum Operated fuel supply system

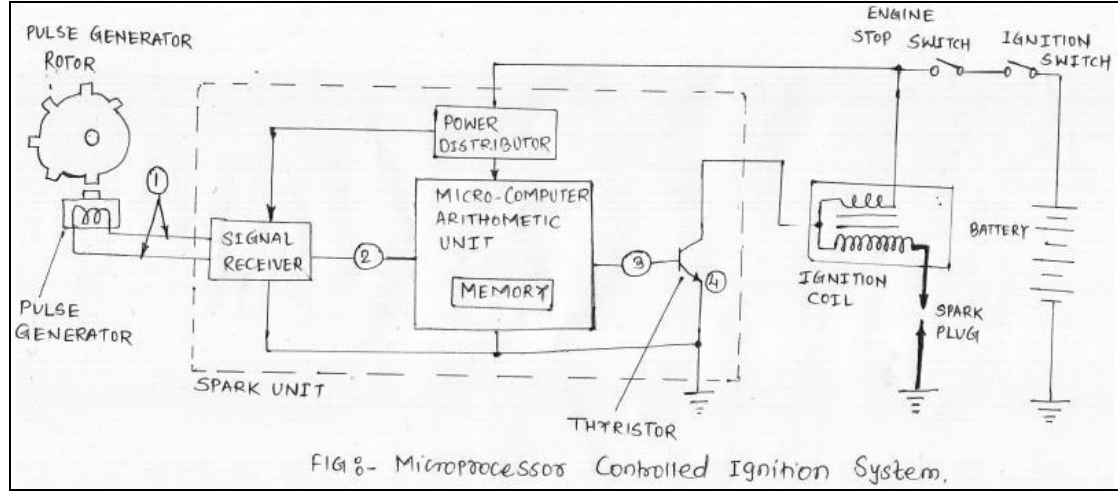


1	c)	State four advantages of electronic fuel injection system.	04
		Advantage of electronic fuel injection system: (Any four-1 mark each) 1. Improved power output. 2. Better fuel efficiency over a wide range of engine speed. 3. Quick warm-up of engine. 4. Reduced engine emission that meets strict emission norms. 5. Better throttle response of the engine. 6. Better pick- up (acceleration). 7. Compact design of fuel supply system. 8. Modular design. 9. Engine performance is maintained under various loads and atmospheric pressures (altitude). 10. Engine need not be tuned from time to time as in case of carbureted engine fuel supply system. 11. Engine idle speed is controlled by microprocessor and so precisely controlled. 12. Vapour lock problem does not occur, as EFI system uses an electric fuel feed pump. The pump maintains sufficient pressure in the fuel line to avoid vapour lock in hot weather. 13. Improved atomization. Fuel is forced into the intake manifold under pressure that helps break fuel droplets into a fine mist. 14. Better fuel distribution. Equal flow of fuel vapors into each cylinder. 15. Smoother idle. Lean fuel mixture can be used without rough idle because of better fuel distribution and low-speed atomization. 16. Better cold weather drivability. Injection provides better control of mixture enrichment than a carburetor.	04
1	d)	Why caster angle is provided in the steering? Explain its purpose.	04
		Answer: Caster is the backward tilt of the king pin and axle when viewed from the side. 1) The purpose of caster is to give the vehicle directional stability or ability to travel straight ahead with minimum of actual steering by the driver. 2) This is accomplished by the fact that the projected centre line of king pin strikes the road ahead of the contact point of the tyre. This has a tendency to lead or drag the wheel behind it, giving the vehicle directional stability. 3) If the axle is set horizontally and the king pin vertically, the weight of the vehicle would be directly above the point of contact. As a result, the wheels would be wandering and the car would lack steering stability. 4) The caster or backward tilt of the axle prevents wheel wander and makes the vertical load precede the point of contact which causes the wheels to run straight normally and to straighten up after turn.	04
1	e)	Compare the drum and disc brake of two wheeler.	04
		Comparison of drum brake with disc brake: (Any four points -1 mark each)	04

Sr. No.	Drum brake	Disc brake
1.	Friction occurs on the internal surfaces therefore heat dissipated only by conduction through the drum	Friction surfaces are directly exposed to the cooling air.
2.	Curved friction pads are used	Flat friction pads are used
3.	Non uniform wear of friction linings.	There uniform wear of friction pads
4.	There is loss of efficiency due to expansion	There is no loss of efficiency due to expansion
5.	Comparatively higher weight	Weight is less so saving up to 20 % is possible
6.	Comparatively higher anti-fade characteristics	Disk brakes have comparatively better anti fade characteristics.
7.	Complicated design	Simple in design
8.	Removal and replacement of brake linings is difficult and consumes more time.	Comparatively easy to remove and replace friction pads
9.	More friction area	Less friction area
10.	Pressure intensity is less	Pressure intensity is more

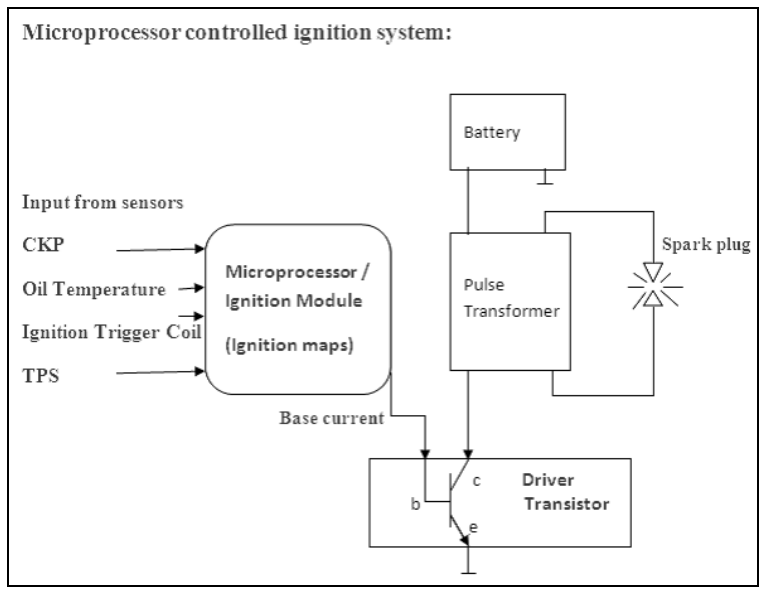
1 f) Draw the block diagram of the microprocessor controlled ignition system. 04

Answer: block diagram of the microprocessor controlled ignition system :

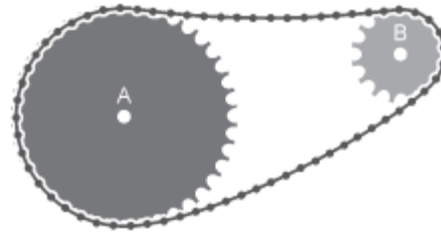


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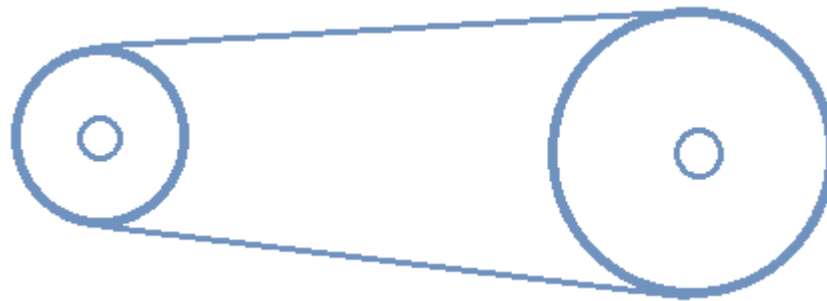


attached to them. E.g. Honda-Activa, Scooterate, mopeds.



Chain-Driven Primary Drive

OR



Belt-Driven Primary Drive

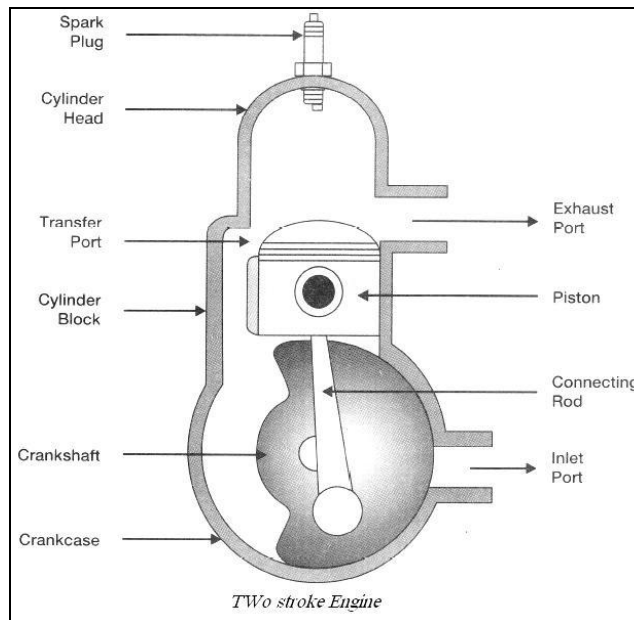
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02

2 b) Explain the arrangement of parts of two strokes Engine.

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Answer (Any Four parts.) One Mark Each.



04



1) Spark plug

Spark plug is used for igniting highly compressed charge in the combustion chamber.

2) Cylinder Head

It is a single casting bolted to the top of the cylinder block. Water passages and combustion chambers are formed in the cylinder heads.

3) Cylinder block

This forms the very base of the engine with cylinders formed in it. The cylinder blocks have water passages formed into them.

4) Crankcase

The part of the cylinder block which houses the revolving parts, the crankshaft and the camshaft is termed the crankcase. It must be strong to withstand impact forces due to gas pressure.

5) Piston

It is cylindrical in shape and forms the movable portion of the combustion chamber.

6) Connecting Rod

A connecting rod acts as a link between the piston and the crankshaft. It converts the reciprocating motion of the piston into a rotary one.

7) Crankshaft

It is the engine component which converts the reciprocating motion of the piston and the connecting rod into rotary motion.

2 c) **State the advantages of multiple valves in Four Stroke Engine.** **04**

Advantages of multiple valve: (Any four- 1 mark each)

1. Increased power output.
2. Better breathing causes **lower pumping losses** and efficient scavenging.
3. Better fuel efficiency over a wide range of engine speed.
4. Light weight engine. Better Power to weight ratio of engine.
5. Reduced engine emission.
6. **Better throttle response** due to lighter weight components of the engine (acceleration and deceleration as well as change in engine performance with respect to throttle position change).
7. **Better pick- up** (acceleration).
8. **Compact design of engine.** i.e. higher power to weight ratio.
9. **Maximum RPM of the engine is increased.** i.e. the engine can be revved at higher rpm and therefore, power output and maximum speed of vehicle is increased.
10. Less frequency of engine decarbonizing and spark plug cleaning.
11. Faster combustion due to central location of the spark plug in combustion chamber.
12. Stable and smooth engine idle operation.

04



		<p style="text-align: center;">OR</p> <p>Scooter tyre are marked as 165X400mm</p> <p>The tyre are specified and designated by the nominal size of their sectional width and the rim diameter.</p> <p>165 mm is rim diameter of scooter tyre</p> <p>400 mm is sectional width of scooter tyre</p> <p style="text-align: center;">OR</p> <p>Tyre size /PR</p> <p>Scooter tyre 3.50-10 4PR</p> <p>3.5 “ is overall diameter of scooter tyre</p> <p>10” is section width of scooter tyre</p> <p>4PR is casing strength (Ply rating) of scooter tyre</p>	<p>01</p> <p>03</p> <p>01</p> <p>03</p>
2	f)	List out the components of starting system and write their functions.	04
		<p>The components of starting system and their functions are as follows</p> <p>Kick Start System</p> <p>1) Kick Start Pedal</p> <p>Kick start pedal is used to start system. When we apply the force on the pedal, kick start pedal rotates which further gives motion and power to kick start shaft.</p> <p>2)Kick start Shaft</p> <p>As we apply the force on the pedal the kick start shaft rotates and at the same time it rotates with the kick start gear</p> <p>3)Kick start Gears</p> <p>Ratchet gear transmits power and motion through kick shaft gear to clutch housing with the help of idler or intermediate gear.</p> <p>4)Kick Start Engagement Device</p> <p>When the kick is applied to start a motorcycle, kick start engagement device actuates the ratchet gear and torsion spring.</p> <p>5) Battery: A starter battery supplies the current to starter motor, needed for engine cranking.</p> <p>6) Ignition switch: It controls the current supplied to the solenoid and to the starter motor for cranking. In starter mode, the switch provides current to solenoid and the starter motor</p>	04



gets supply.

7) **Neutral safety switch:** The switch provides continuity in starter circuit if the transmission is in neutral or clutch is disengaged.

8) **Solenoid:** Solenoid controls a larger cranking current with use of small current carrying circuit that uses a movable core. The core is mechanically linked to the electrical contacts through some form of mechanical linkage.

3. Attempt any **FOUR** of the following :

16

a) What are the types of two wheeler frames? Explain any one.

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Answer : (Types – 1 mark, Explanation of any one with sketch – 3 marks)

Types of frame: Motorcycle/ Mopeds use three basic frames

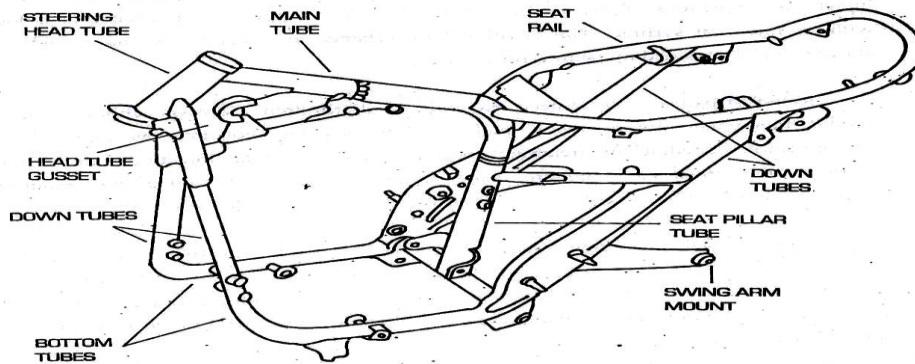
- 1) Cradle-single cradle and double cradle frame
- 2) Back Bone frame
- 3) Stamped frame

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1.Cradle-single cradle and double cradle frame:

The Cradle frame is distinguished by a pair of more or less parallel tubes within which the engine and gear box rest. This design derives its strength from triangular form of the support tubing. In Large high powered vehicles, additional support may be provided by gussets to increase the rigidity of frame. A cradle frame may one tube or two tube can be seen.

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Figure: Typical motor cycle frame of cradle type
(Note: Equivalent credit shall be given to any other suitable sketch)

OR

2. Back Bone frame

In the Back Bone frame, the engine hangs from the top of the frame and acts as a structural member. This design requires the frame to be relatively heavy to provide adequate strength. Since the engine is not now enclosed by the lower frames tubes, the engine service becomes simplified.

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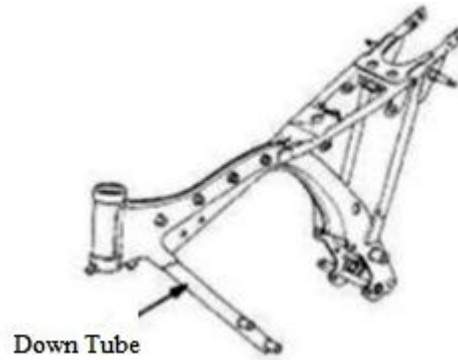


Figure: Back Bone Frame

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3. Stamped frame

Usually consists of two pieces of stamped sheet metal that are welded together. Frame strength in this design is achieved by the shape of stamping. A stamped frame is least expensive to produce. It is normally used on inexpensive, small displacement motor cycles and moped

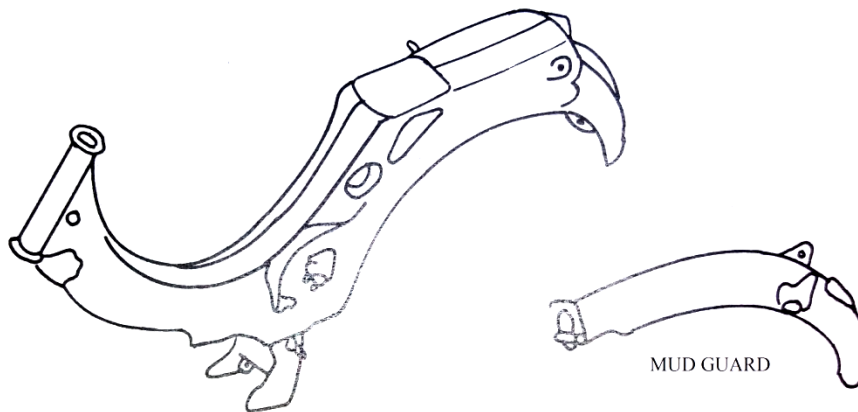


Figure: Stamped frame

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b) Describe tail pipe arrangement of exhaust system.

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Answer:

Tail pipe is final length of exhaust pipe which ends with just a straight or angled cut where it vents open to air. Some tail pipes also have a small resonator inside for additional noise reduction. The exhaust gases leave the muffler or silencer, not in a steady stream but as a pulsating one. Each wave as it reaches the outlet is reflected back into the pipe. It is desirable that on its way back it reaches the muffler not at the moment of a fresh discharge from it but between two discharges. This can be realized by adjusting length of the tail pipe, either

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shortening or lengthening. In some installation, the tail pipe goes up vertically. Then it is called stack, if stack goes up through a roof, it should allowed to expand freely.

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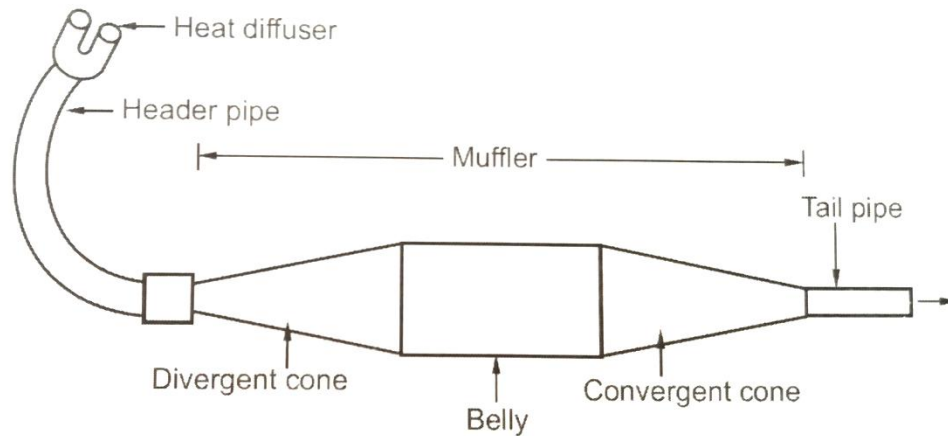


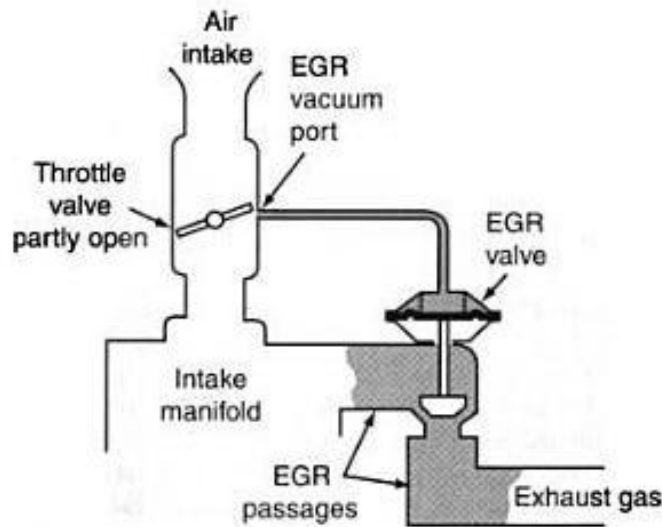
Fig- Tail Pipe

(Note: Equivalent credit shall be given to any other suitable sketch and relevant description)

c) Draw the block diagram of Exhaust Gas Recirculation and labeled it

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Answer: Labeled block diagram of EGR System:



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Figure: The EGR valve controls the amount of exhaust flowing back into intake manifold

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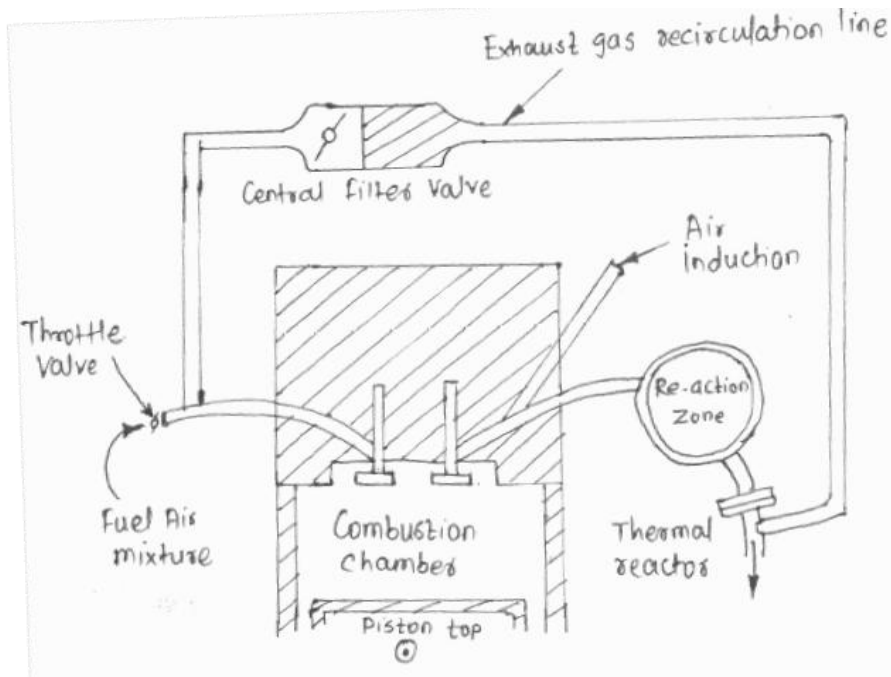


Figure: Exhaust Gas Recirculation System

	<p>Figure: Exhaust Gas Recirculation System</p>	
<p>d).</p>	<p>State four advantages of gas filled shock absorber for rear end suspension.</p>	<p>04</p>
	<p>Answer: Advantages of gas filled shock absorber used at rear end- (Any four points -1 Mark each)</p> <ol style="list-style-type: none"> 1. The full diameter of the tube can be used as a working chamber and thereby a larger volume of oil becomes available for damping. 2. The larger volume of oil made available in any one stroke because of the adjustments between gas and oil volumes provides a better facility for the damping force. 3. The tolerance to heat in gas filled shock absorber is greater. 4. Gas filled shock absorber give longer life to tyres and other related components in the suspension such as springs, brushes etc. 5. A gas filled shock absorber is designed to reduce foaming of the oil. 	<p>04</p>
<p>e)</p>	<p>Explain Hydraulic brake with neat sketch.</p>	<p>04</p>
	<p>Answer: Hydraulic Brake: In Two wheeler hydraulic brake system used in incorporate with disc brake.</p> <p>Construction: A disc brake consists of a rotating disc and two friction pads which are actuated by hydraulic braking system. The friction pads remain free on each side of disc when brakes are no applied. They rub against disc when brakes are applied to stop the vehicle.</p> <p>Working: In a disc brake, the fluid from the master cylinder is forced into a caliper where it presses against a piston. The piston in turn crushes two brake pads against the disc that is being attached to wheel, making it to stop or slow down. Main advantage of disc brakes is their resistance to wear as the discs remain cool even after repeated brake applications.</p>	<p>01 01</p>

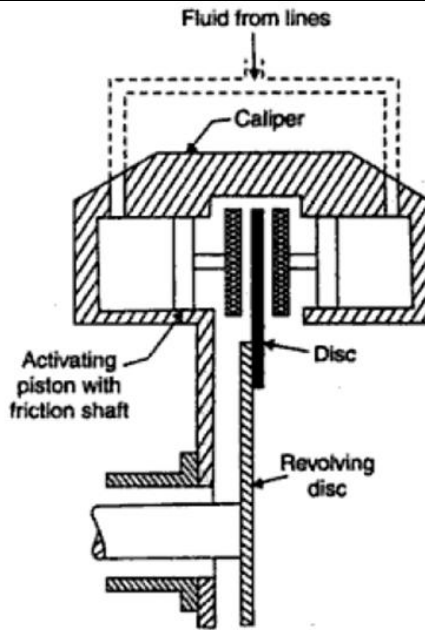


Figure: hydraulic disc brake

(Note: Equivalent credit shall be given to any other suitable sketch and relevant description)

02

f) Write down the benefits of Twin-Spark Ignition system.

04

Answer: Benefits of twin spark ignition system- (Any four- 1 mark each)

1. The twin spark plugs introduce spark simultaneously in the combustion chamber and improve combustion process, which leads to low emissions, better fuel efficiency and minimizes knocking drastically.
2. Because of twin sparks the diameter of the flame increases rapidly that would result in instantaneous burning of fuels. Thus force exerted on the piston would increase leading to better work output.
3. Less vibration and noise.
4. Long life of the engine parts such as piston ring and valve stem
5. Decreases in the specific fuel consumption.
6. No overheating.
7. Increase the thermal efficiency of engine and even bear high load on it.
8. Increase the thermal efficiency of the engine & even bear high loads on it.

04

4. Attempt any TWO of the following :

16

a) Explain the working of constant mesh gearbox with neat sketch and compare its working with four wheeler gear box.

08

(Working – 3marks, Sketch – 3 marks, Comparison – 2marks (1/2 marks for each parameter))

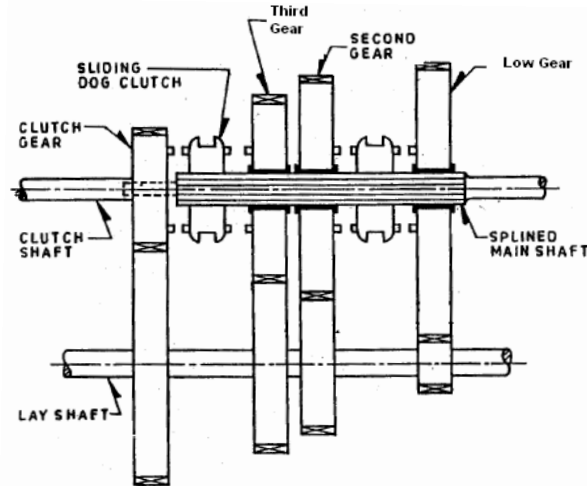
Answer: Working of constant mesh gear box:

A simplified diagram of constant mesh box has been shown in Figure. In this gear box, all gears on the main transmission shaft are constantly connected to corresponding gears on countershaft or lay shaft. In addition, two dog clutches are provided on the main shaft. One dog clutch is between the third gear and clutch gear and another is between the first (Low)

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gear and second gear.

Top or 4th speed gear is obtained when the left dog clutch is slided to left to mesh with clutch gear by using the gear shift lever. In this case, main shaft rotates at the same speed as that of clutch gear or engine crankshaft speed which is the maximum speed. Third gear is obtained when dog clutch (left side) meshes with third gear on main shaft. In this way by sliding the second dog clutch, second and first gears are obtained.



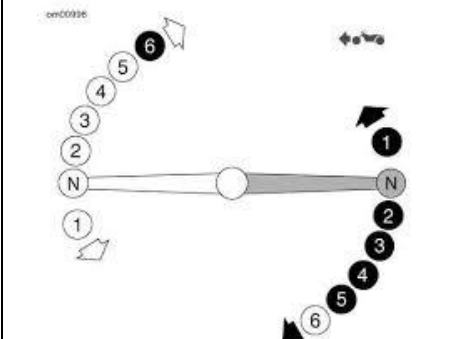
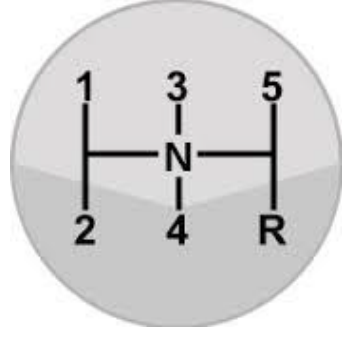
(Note: Equivalent shall be given to any other suitable sketch and relevant description)

Comparison of two wheeler and four wheeler gear box based on working condition:(any four points)

Sr. no.	Parameter	Two wheeler gear box	Four wheeler gear box
1.	Type of gear box	Only constant mesh gearbox is used. Motorcycle gearboxes are un-synchronized in principle.	Constant mesh / sliding mesh or synchromesh gearbox may be used.
2.	Dog system	Motorcycle dog system is simple, lighter and takes up less space.	Car dog system is heavier and takes up more space.
3.	Skill required in changing gear	More skill is required to change gears.	Less skill is required to change gears.
4.	Gear selection	Motorcycle transmissions are Sequential. i.e. whether up shifting or downshifting, you must select each ratio in order, with neutral available only between first and second gears.	Driver can access neutral from any gear or speed. Car transmissions are not sequential. But sequential shifting is preferred.
5.	Maintenance	Less maintenance	More maintenance: Due to complicated dog shift arrangement. Synchronizer cones may need replacement.

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6.	Lubrication	Uses engine oil as lubricant for gearbox. (SAE 30W40)	Uses separate oil as lubricant. (SAE 90)
7.	Symbolic presentation of gear shifting		

b) State the types of Air filter used in two wheeler and explain the construction of any one with neat sketches

08

Answer: (Types- 2 marks, Explanation of any one with sketch – 6 marks)

Two types of Air filter

1. **Foam Type air filter**
2. **Dry Type air filter**

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1. Foam Type air filter:

Construction: It consists of filtering element which is made from a polyster or polyurethane low density sponge which has been impregnated with lubricating oil. The foam filter usually fits over a metal or plastic apparatus to help hold its shape. One side of air filter is open to atmosphere and other is connected to the induction side of the engine.

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A side of air filter which is open to atmosphere sucks the atmospheric air through duct. The air passes through the tiny holes of air filter. The oil which is present over the foam air filter reduces the size of air passages & it provides a sticky retaining medium for the un trapped dust. This type of air cleaner should be cleaned periodically, about every 8000 km.

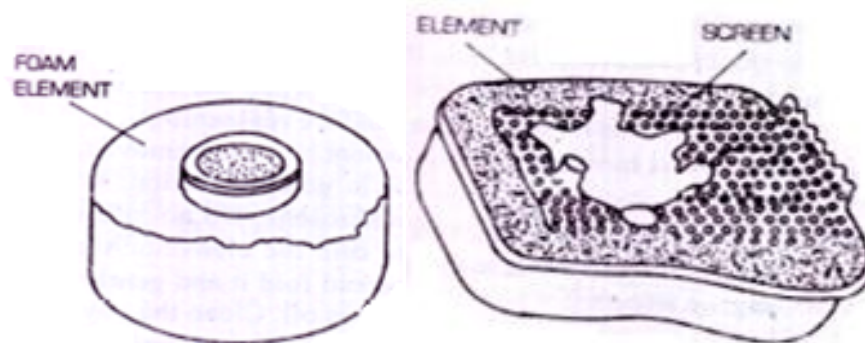


Fig: Foam Type air filter

03

OR

2. Dry Type air filter:

Construction:

It consists of cleaning elements only and not the oil bath the cleaning element is a specially pleated paper element, over which is put fire mesh screen to provide strength. This cleaning element is enclosed in a silencing chamber. Figure shows parts of a dry type cleaner.

The dust particles and dirt is filtered from the air by the filter and thereby it protects the engine and increases its life. In this process the filter elements becomes dirty. It should be cleaned periodically. It is a light duty air cleaner. The paper is corrugated to increase the surface area and hence the breathing capabilities of the filter.

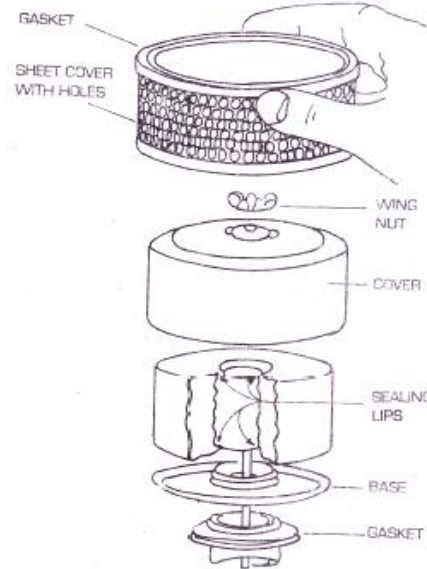


Fig : Dry Type air filter

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c) Draw schematic diagram of charging system and explain its working.

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Answer:

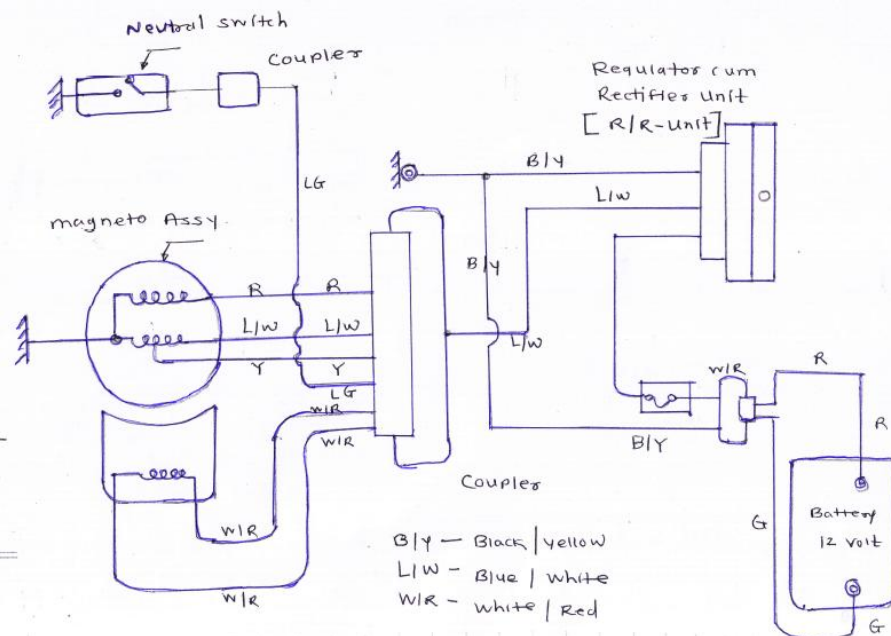


Figure: Circuit diagram of two wheeler charging system showing AC and DC circuits

04



Working of charging system of two wheeler:

The main components of two wheeler charging system are-

1. Battery
 2. Regulator cum rectifier unit (Regulator and rectifier are assemble in one unit)
 3. Generator (Magneto) assembly
 4. Fuse
- Generator produces an A.C. supply of 12 V.
 - Blue / white (L/W) wire supplies 12 V A.C. from generator to regulator cum rectifier unit.
 - Regulator controlled the supply of current and voltage whereas rectifier converts A.C. supply in to D.C.
 - Regulator cum rectifier unit supply 12-14.5 V D.C. to the battery with the help of filament type fuse.
 - This fuse is having capacity to deliver 12 V to 16 V and 15 A current.
- In case of failure of fuse it disconnects the supply from regulator cum rectifier to battery.

04

5 Attempt any TWO of the following.

16

5 a) What is catalytic convertor? Explain its working with neat sketch.

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Answer:

(Meaning of catalyst – 2 marks, working – 4 marks, sketch – 2 marks & credit should be given to sketch)

Three Way Catalytic Converter:

It is a device with porous ceramic structure fitted in the engine exhaust system which converts various emissions into less harmful ones using generally a combination of platinum, palladium & rhodium as catalysts.

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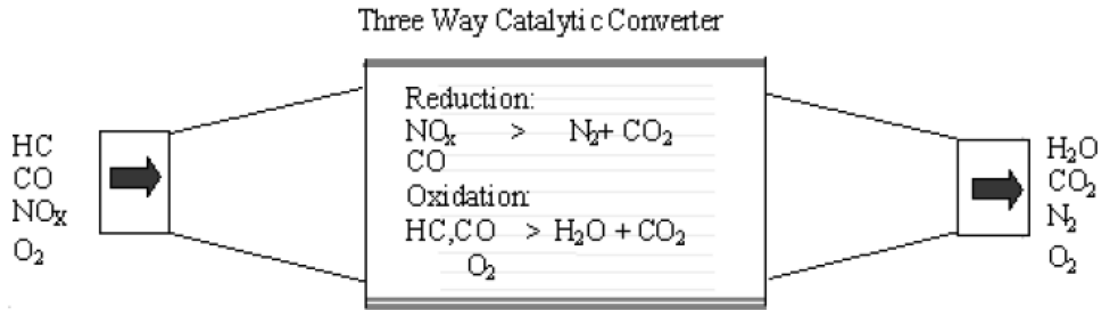
Working:

The catalytic converters conversion rate is largely a function of operating temperature; no meaningful treatment of pollutants takes place until the converter has reached an operating temperature of approximately 400...800C provide ideal conditions for maximum efficiency and extended service life.

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Catalyst Reduction First, nitrogen oxide gives up its oxygen. This only occurs when a sufficient amount of carbon monoxide is available for the oxygen to bond with. This chemical reaction results in reduction of nitrogen oxide to pure nitrogen and oxidation of carbon monoxide to form carbon dioxide.

Catalyst Oxidation. Second, hydrocarbon and carbon monoxide continue to burn. This occurs only if there is a sufficient amount of oxygen available for the hydrogen and carbon to bond with. This chemical reaction results in oxidation of hydrogen and carbon to form water vapour (H₂O) and carbon dioxide (CO₂).



02

Fig: Catalytic convertor

OR

Two Way Catalytic Converter:

The catalytic converter is a device, placed in the exhaust pipe, which converts various emissions into less harmful ones using generally a combination of platinum, palladium & rhodium as catalysts. They make for a significant and easily applied method for reducing tailpipe emissions.

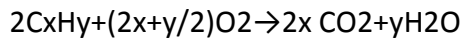
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Working:

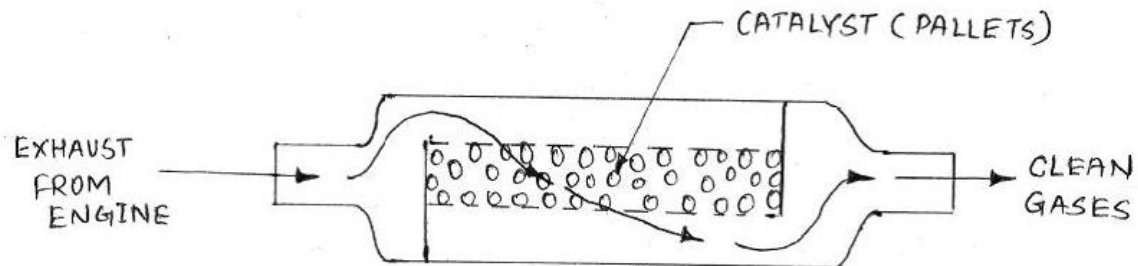
A two way catalytic converter has two simultaneous task:

- 1) Oxidation of carbon monoxide to carbon dioxide: $2CO + O_2 \rightarrow 2CO_2$
- 2) Oxidation of unburnt hydrocarbons (unburnt & partially burnt fuel) to carbon dioxide & water:

04



This type of catalytic converter is widely used on diesel engines to reduce hydrocarbon & carbon monoxide.



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Fig: Catalytic convertor

5	b)	<p>Explain the working of Condenser Discharge Ignition (CDI) System and write its merits.</p>	08
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Answer: (any one method with expected results and conclusion credit given to sketch)

Construction & Working of Condenser / capacitor discharge ignition(CDI) system: (3 marks)

It mainly consists of 6-12 V battery, ignition switch, DC to DC converter, charging resistance, tank capacitor, Silicon Controlled Rectifier (SCR), SCR-triggering device; step up transformer, spark plugs. A 6-12 volt battery is connected to DC to DC converter i.e. power circuit through the ignition switch, which is designed to give or increase the voltage to 250-350 volts. This high voltage is used to charge the tank capacitor (or condenser) to this voltage through the charging resistance. The charging resistance is also so designed that it controls the required current in the SCR.

Depending upon the engine firing order, whenever the SCR triggering device, sends a pulse, then the current flowing through the primary winding is stopped. And the magnetic field begins to collapse. This collapsing magnetic field will induce or step up high voltage current in the secondary, which while jumping the spark plug gap produces the spark, and the charge of air fuel mixture is ignited.

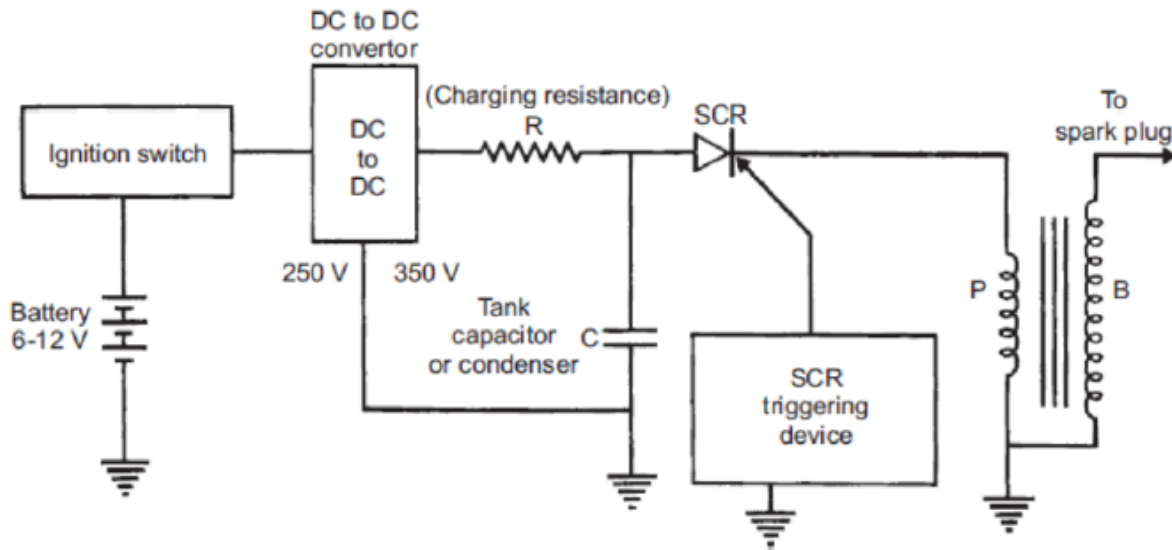


Fig: Capacitance Discharge Ignition System

OR

Construction and working:

CDI system consists of primary circuit and secondary circuit.

The primary circuit consists of: i) Primary winding of pulse transformer ii) Condenser iii) Resistance iv) SCR v) Pulse generator vi) Battery vii) DC to AC convertor/charging device.

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The secondary circuit consists of:

- i) Secondary winding of pulse transformer
- ii) Spark plug
- iii) Spark plug HT coil.

Working:

CDI system uses charge of capacitor for generating spark- using pulse transformer.

Thyristor/ silicon controlled rectifier is used as switch- for primary circuit current through capacitor.

It also uses a pulse generator to trigger SCR through Gate circuit.

Pulse transformer has low inductance, so the change in flux across primary and secondary windings is very rapid.

This provides high voltage spark (about 30,000V) during the entire speed range of the engine.

The electronic circuitry uses conversion of AC to DC charging device, signal conditioning and amplifying unit and control circuit.

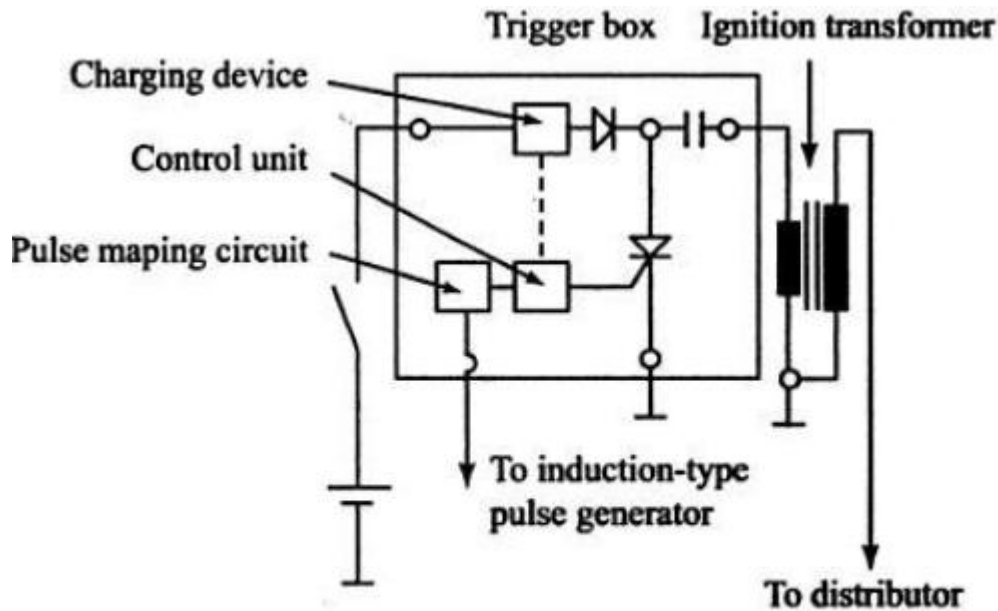


Fig. Schematic of Capacitive Discharge Ignition (CDI) System

Merits: (any two- 2marks)

1. High voltage at secondary circuit throughout engine speed range.
2. Spark plug fouling is greatly reduced.
3. Maintenance is easier.
4. Precise control of ignition timing is obtained.
5. Input current and output available voltage are constant over a wide speed range.
6. To offset the problem of the short spark duration, Advantage is sometimes taken of the high secondary output by increasing the sparking plug gap to give a larger spark.
7. Fast build up of output voltage.

5	c)	<p>State the importance of :</p> <ul style="list-style-type: none"> i) Crash bar ii) Saree-guard iii) Jacket iv) Helmet 	08
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Answer: (Importance- 2 marks each)

i) Crash bar:

Crash bars aim to protect motorcycle engines and body panels as well as it is used to protect the rider. It is also used as a mount point for accessories like highway pegs, lights and, on police motorcycles, sirens, cameras and radar guns.

02

ii) Saree-guards-

The Saree guards are very practical accessories that can prevent a lot of unwanted accidents. The Saree guard is an important though local piece of initiative to help loose & flowing clothes from getting tangled in the rear wheel. There have been numerous events where female pillion riders have ended up with injuries because the Saree or Dupatta they were wearing got pulled into the rear wheel resulting in them getting either thrown off the bike or in extreme events, facing the risk of getting choked So for safety purposes the Saree guard is most essential. The Saree guards will not only protect the rider, but also the cargo from being pulled into the rear wheel.

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iii) Jacket-

While driving a motorcycle, use proper jacket to cover the body. Jacket closes the body completely; due to wind our cloths are continuously blows, making tedious sound which was very enormous i.e. undesirable. Jackets never stick to the body. These are made from impregnated/laminated cloths; these are light weight, high resistance to sunlight, wear and tear resistance in case of accidents. Water droplets are not sticking. Jacket adds the effective driving values. These are available in dark glowing colors with radium spectrum so that at night driving it shows your presence on the road.

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iv) Helmet:

The primary goal of motorcycle helmet is motorcycle safety to protect the riders head during impact, thus preventing or reducing head injury and saving the riders life. Some helmets provide additional convenience such as ventilation, face shield and ear protection. The helmet is used to protect the head injury at front, rear and head restraint. The helmet protects against cervical spine injury. It provides protection against noise, wind and improves visibility.

02

6 Attempt any TWO of the following.

16

- a) State the use of:**
i) LED lights ii) Reflector iii) Speedometer iv) Trip meter

08

Answer: (Use – 2 marks each)



	<p>i) LED lights</p> <p>An LED lamp is a light-emitting diode (LED) product which is assembled into a lamp (or light bulb) for use in lighting fixtures. A light-emitting diode (LED) is a semiconductor device that emits visible light when an electric current passes through it.</p> <ol style="list-style-type: none"> 1. LEDs are bright but use very little power, typically 26 mA of current per LED 2. LED produce extremely low amount of heat, high impact resistant and come in waterproof encloses. 3. Average life of LED is approximately 1, 00,000 hours or 10 years of continuous use much longer than convention light bulb. 4. LED looks cool and gives your bike a unique custom look. <p>ii) Use of Reflector: It act as mirror surface from which head light rays /light are scattered on the road front in downward direction effectively. In tail lamp, reflectors are curves and concave, led light scatter the light rays at rear end such that far from distance it should visualize clearly. It is a piece of glass or metal for reflecting light in a required direction.</p> <p>iii) Speedometer: Speedometer indicates the driving speed of vehicle that is kilometre per hours. It also indicates the total running kilometre by vehicle (odometer). A speedometer or a speed meter is a gauge that measures and displays the instantaneous speed of a vehicle. Speedometer is a free GPS based digital head up display (HUD) that shows useful speed and distance information for your journey.</p> <p>iv) Trip meter- It is used to record distance covered in a trip or tour. Also helps in calculating mileage. A trip meter is reset at any point in a journey, making it possible to record the distance travelled in any particular journey or part of a journey.</p>	<p>02</p> <p>02</p> <p>02</p> <p>02</p>
<p>b)</p>	<p>Describe the ergonomics aspect of:</p> <p>i) Rider and pillion rider ii) Handle bar position iii) Floor/Foot rest for driver iv) Floor/Foot rest for pillion rider</p>	<p>08</p>
	<p>Answer: (02 marks for each ergonomic aspect)</p> <p>i) Rider and pillion rider:</p> <p>The design of the motorcycle is limited by the physical constraints of making the machine work. Comfort and ease of use, and ultimately your safety, will be determined by the type of bike you choose and this should depend on how you plan to use it. The seat and footrests are the right height for you. The fit of the bike to the user can be critical in long term comfort. Riders, of course, are different shapes and sizes so a bike that works well for one person may not work for someone else. It is more convince to both rider & pillion rider to seat for long trip or tour. The tapper portion of raised seat supports the seating arrangement for rider. The taper portion of seat supports the back bone of rider. For pillion riders the design of seat at rear end is important. At the time of braking due to inertia effect the pillion rider should moves on front side pushing the rider at downward direction not in forward direction. It improves the comfort driving as well as seating. Now a day Instead of using separate seat for rider & pillion rider, combined seat is used for better comfort. It provides large space as compared to earlier (old) designed seat. The front side of seat should have narrow section</p>	<p>02</p>



which gives comfort zone to rider while driving. Seat should have good cushioning (use of helical tension spring & leather) to protect both rider & pillion rider from shocks & vibrations on road.

ii) **Handle bar position:**

It gives rider a proper leverage to make the front wheel as his wish or as he required. The position of handle bar should be ergonomically correct. It is related to rider's driving comfort. The handle bar is fitted with controlled sleeves and handgrip on both sides. The handle bar it is made in different shapes and design keeping in mind the rider comfort and different views. The handle bar position is concerns with the shape of seat and foot rest. The location of foot rest & shape of seat as well the handle bar position differs as per manufacturers. It also depends upon the type of bike. Different type of bike has a body position, feet position and hands position The Handle bar position gives proper gesture to the rider. Improper selection of bike may create the back pain or other problems to the rider while long drive. The handle bar should be lighter and transmit less vibration.

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iii) **Floor /Foot rest for driver:**

Motorcycle footrest not only help you get more comfortable on your bike, but also allow you to set up a more stable base using only your feet and legs. When you adjust your motorcycle so you sit on it comfortably, so the controls are right at your fingers and toes. The design of the motorcycle is limited by the physical constraints of making the machine work. Comfort and ease of use, and ultimately your safety, will be determined by the type of bike you choose and this should depend on how you plan to use it. The seat and footrests are the right height for you. The fit of the bike to the user can be critical in long term comfort. Riders, of course, are different shapes and sizes so a bike that works well for one person may not work for someone else. It is more convince to both rider & pillion rider to seat for long trip or tour.

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iv) **Floor/ Foot rest for pillion rider:**

Foot rest helps to maintain riding comfort and control of vehicle as driver and pillion rider lean to change position of centre of gravity of vehicle. Obtain support and helps rider to get into proper position during suspension movements. Rider tends to stand on the foot rest while riding on a bumpy road to reduce effect of road shock. Certain models of motorcycles do offer the option of a "mid-control" that brings the foot placement closer to a naturally seated position, which is more suitable for rider and pillion rider.

02

c) **Explain the Aesthetic Aspects of:**
i) Head lamp fairing ii) Side panels for Scooter iii) Ground clearance iv) Mud guard shape and position **08**

Answer: (2 marks for each aesthetic aspect, Equivalent points should be given credit)

i) **Head lamp fairing :**

A motorcycle fairing is a shell placed over the frame of some motorcycles, especially racing motorcycles and sport bikes, with the primary purpose to reduce air drag. The secondary functions are the protection of the rider from airborne hazards and wind-induced



hypothermia and of the engine components in the case of an accident. The major benefit of a fairing on sport touring and touring motorcycles is a reduction in fuel consumption. The reduction in aerodynamic drag allows for taller gearing, which in turn increases engine life. The head lamp is open to atmosphere. The front upcoming air strikes directly on it. So that the head lamp body must be robust and it should be suitably installed. If any sharp edge is on the outer body of the head lamp creates air resistance which affects the efficiency of vehicle. So that the shape must be streamline with no sharp edges. The rounded portion of outer body minimized the air resistance. In this way the head lamp must be streamlined aerodynamically shaped and easy to install. The angle of various beams must be suitably adjusted so that the visibility is cleared.

ii) Side panels for Scooter :

The side panels for scooter / Scooterette provide the following:

1. They cover internal components like wiring harness, engine and other systems from dirt, dust and protect them.
2. Components like battery, air filter and electrical/ electronic components are protected from dirt, dust and from thieves. Locking arrangement is provided in some designs.
3. Removal of side panels expose wiring harness and other systems for repair/ maintenance.
4. It proves a good look with graphics and panel colours matching the colour of vehicle fuel tank.
5. Appropriately shaped side panels proved aerodynamic shape to the vehicle and reduce air drag. The entire body of the motorcycle is covered to provide the lowest attainable drag coefficient ratio. It reduces fuel consumption.
6. In event of a crash, the side panels slide against the road surface and the engine and chassis are protected. It also saves injury to the rider and pillion rider from getting injured.
7. A reduction in air drag allows for taller gearing which in turn increases engine life.
8. Scooter/ Scooterette Side panels also protect the rider/ pillion rider from the engine heat and hot exhaust muffler. Some designs include a spare wheel within a side panel.
9. The rider's clothes do not get stuck at protruding components/ system assemblies or torn on account of rider's body movement.
10. Side panels protect the rider and pillion rider from the splashed water, dust, dirt and debris on the road.

iii) Ground clearance :

It overcomes potholes and bumps on road with ease and at certain speeds without worrying about any part of vehicle being hit by the road irregularity. It provides adequate cornering clearance during turns. It gives adequate height to the seating position of rider as well as accommodate for change in position of suspension height and during brake dip. It enable driver to ride vehicle through low lying water logged areas without the trouble of water entering engine systems. The ground clearance should be such that the aesthetics and aerodynamic requirement of motorcycle does not affect. From aesthetics point of view ground clearance should be minimum, to achieve the maximum vehicle stability.

iv) Mud guard shape and position :

It is used for styling and eye catching looks. It also gives the sporty styling. It improves the personality of rider. It makes people attractive. The combination of black and chrome styling gives better aesthetics look. Mud guard can be large rectangular sheets suspended behind

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		the tires. It protects the vehicle, passengers, other vehicles from mud and other flying debris thrown into the air by the rotating tyres. Best coverage, protects bike as well as rider, and protects the rider behind you. Without mudguards a bike looks like any regular road racing bike.	
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