



WINTER– 14 EXAMINATION

Subject Code: 17521

Model Answer

Page No: 1/28

**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.
- .....

|   |           |
|---|-----------|
| 1. A) Attempt <b>any three</b> of the following   | <b>12</b> |
| a) State four major components of transmission system of motorcycle and write function of each.   | 04        |
| Answer: The major components of transmission system of motorcycle are: ( <i>Any four- 1 mark each</i> )   |           |
| <b>1. Clutch:</b><br>i) Clutch disengages and engages the engine to the transmission whenever required. ii) It transmits engine power to the gear box. iii) By using clutch we are able to shift the gears smoothly without damaging gear teeth.  | 04        |
| <b>2. Gear box:</b><br>i) It is used to transmit power and motion from engine to rear wheels by using clutch.<br>ii) Gear box provides high torque at starting and hill climbing by using lower gear. iii) It provides various speed and torque combination by using set of gears iv) The transmission also provides a neutral position so that the engine and the road wheels are disconnected even with the clutch in the engaged position. |           |
| <b>3. Drive chain and sprocket:</b><br>i) These are used to transmit a power and speed from gear box to rear wheel. ii) By using Drive chain and sprocket we will get maximum velocity ratio.   |           |
| <b>4. Clutch lever:</b><br>i) The clutch lever is used to disengage and engage the clutch by clutch cable. ii) it act as a leverage which further connects clutch cable to the clutch lever mechanism which is fitted on the crank case.  |           |
| <b>5. Gear change lever or pedal:</b><br>i) It is used to shift the gear as per the driver's requirement. ii) It transmits the necessary power to gear drum.  |           |

WINTER- 14 EXAMINATION

Model Answer

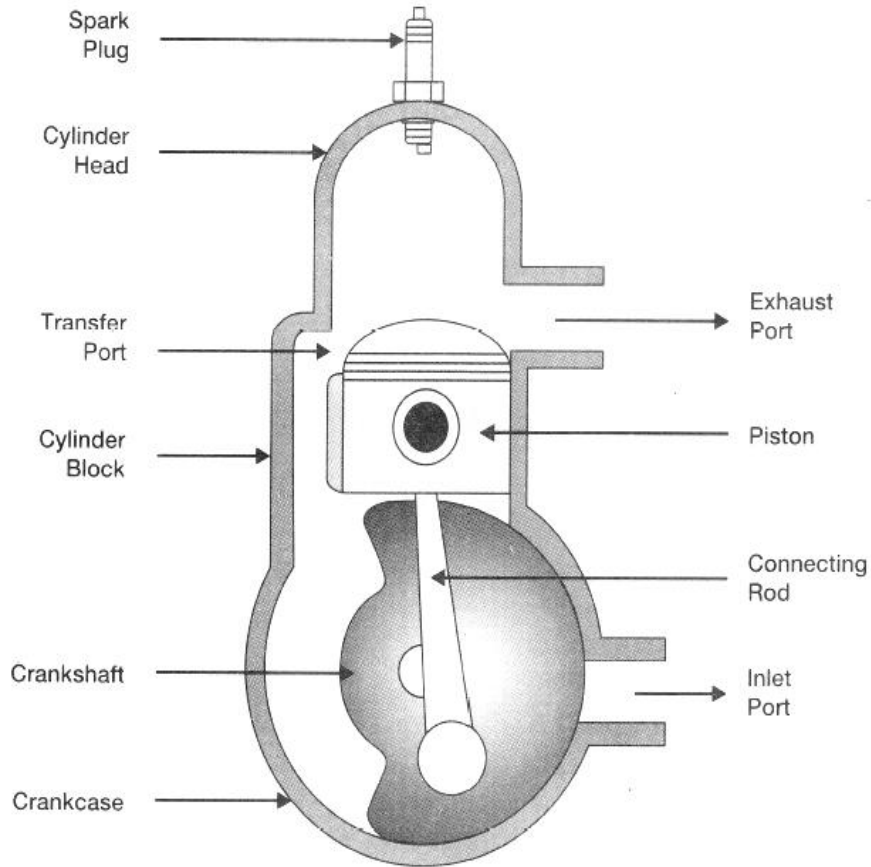
Subject Code: 17521

Page No: 2/28

b) Draw schematic diagram of two-stroke engine (petrol) and label the parts.

04

Answer: **Schematic diagram of two-stroke petrol engine:** (Sketch - 2 marks, Correct labeling - 2 marks)



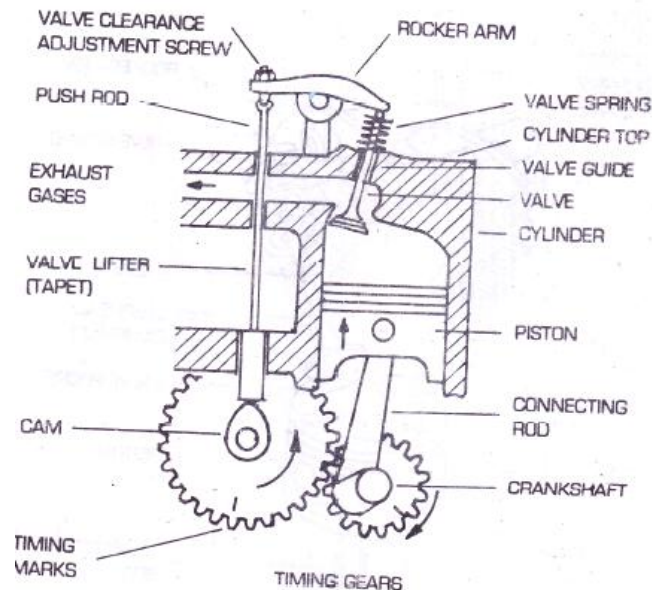
*Two stroke Engine*

04

c) Draw overhead valve arrangement and list its two advantages.

04

Answer: **Overhead valve arrangement:** (Correct Labelled daigram- 2 marks, two advantages-2marks)



*Overhead valve arrangement*

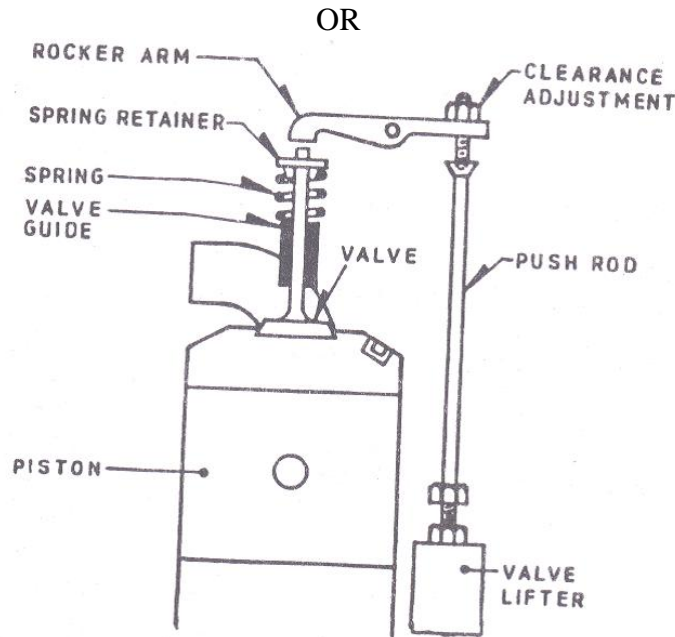
02

WINTER- 14 EXAMINATION

Subject Code: 17521

Model Answer

Page No: 3/28



02

**Advantage of overhead Valve: (Any two)**

1. The entry of fresh charge into the cylinder and exhausting of products of combustion from the cylinder becomes easier and more efficient.
2. Overhead valve arrangement makes the engine slightly shorter than overhead camshaft.
3. Due to less height, this type of engine is well balanced so that less vibrations are created
4. The distance between centre of gravity and ground is less so that vehicle had better handling and stability.
5. Overhead valve arrangement has a less complex drive system.

02

d) Compare petrol lubrication system with pressurized lubrication system.

04

Answer: (Any 4 points)

| Sr. No | Petrol lubrication system  | Pressurized lubrication system  |
|--------|--|---|
| 1      | This system is generally adopted in two stroke engine  | This system is generally adopted in four stroke engine  |
| 2.     | No need of oil pump  | Need of oil pump  |
| 3.     | Lubricating oil is mixed with petrol   | No need to mix lubricating oil with petrol  |
| 4.     | Less space required for oil sump   | More space required for oil sump  |
| 5.     | If the engine is allow to remain unused for considerable time, lubricating oil separate off from petrol and leads to clogging of passages in corrobator, resulting engine straining trouble. | If engine is allow to remain unused for considerable time, no need to separate petrol in engine oil because they are already separated from each other. Drain engine oil and petrol separately. |
| 6.     | Number of parts involved in this lubrication system is very less, at higher speed this system is not working effectively.  | Number of parts involved in this lubrication system is higher, at higher speed this system is working effectively.  |
| 7      | Examples : Scooter , M-80, Rickshaw  | Examples: Pulsar, Caliber 115, Bajaj Discover 115.  |

04

WINTER- 14 EXAMINATION

Subject Code: 17521

Model Answer

Page No: 4/28

B) Attempt **any one** of the following

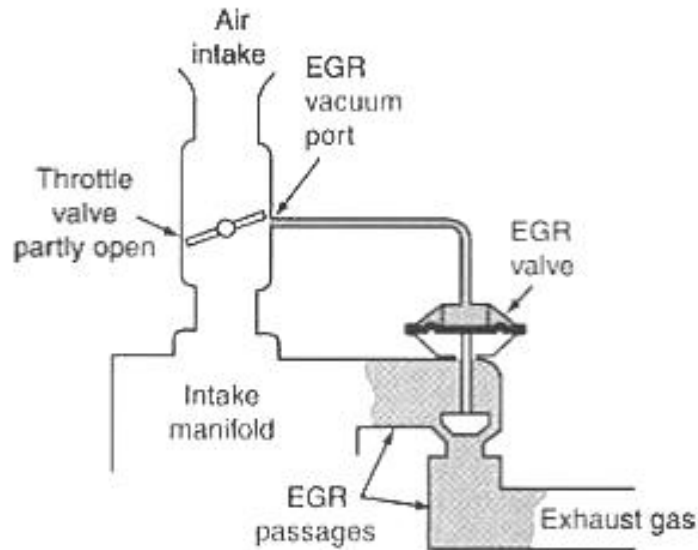
06

a) Draw a block diagram of EGR and describe its working.

06

Answer:

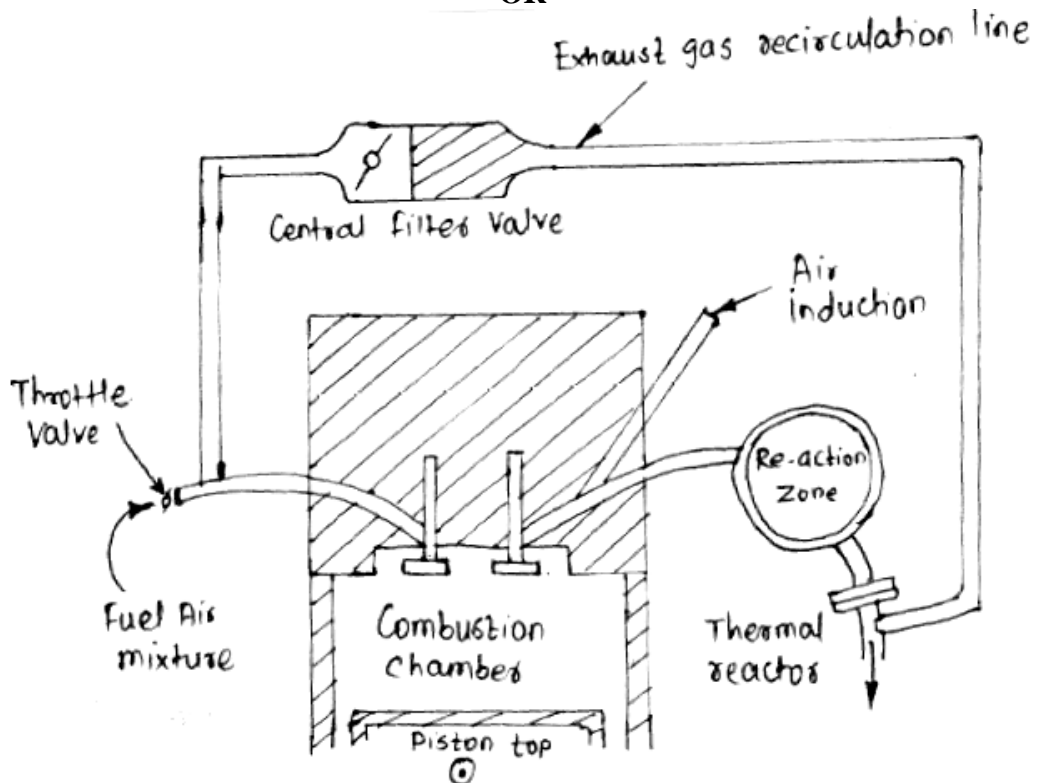
EGR means Exhaust Gas recirculation



03

Fig: The EGR valve controls the amount of Exhaust flowing back into the intake manifold

OR



03

Fig:- Exhaust gas recirculation System

WINTER- 14 EXAMINATION

Subject Code: 17521

Model Answer

Page No: 5/28

**Working:**

The EGR system recirculates CO<sub>2</sub> & H<sub>2</sub>O gases through the intake manifold in order to reduce the temperature at which combustion takes place. When the air/fuel mixture & exhaust gases are mixed together, the proportion of fuel in the air/fuel mixture naturally falls (mixture becomes leaner), and in addition, some of the heat produced by combustion of this mixture is carried away by the exhaust gas. The maximum temperature attained in the combustion chamber therefore falls, reducing the amount of NO<sub>x</sub> produced. The EGR system allows a small amount of exhaust gas (less than 10% of total) to be supplied into the incoming air/fuel mixture. The main aim is to reduce the NO<sub>x</sub>.

03

b) Describe the working of CDI system with help of schematic diagram.

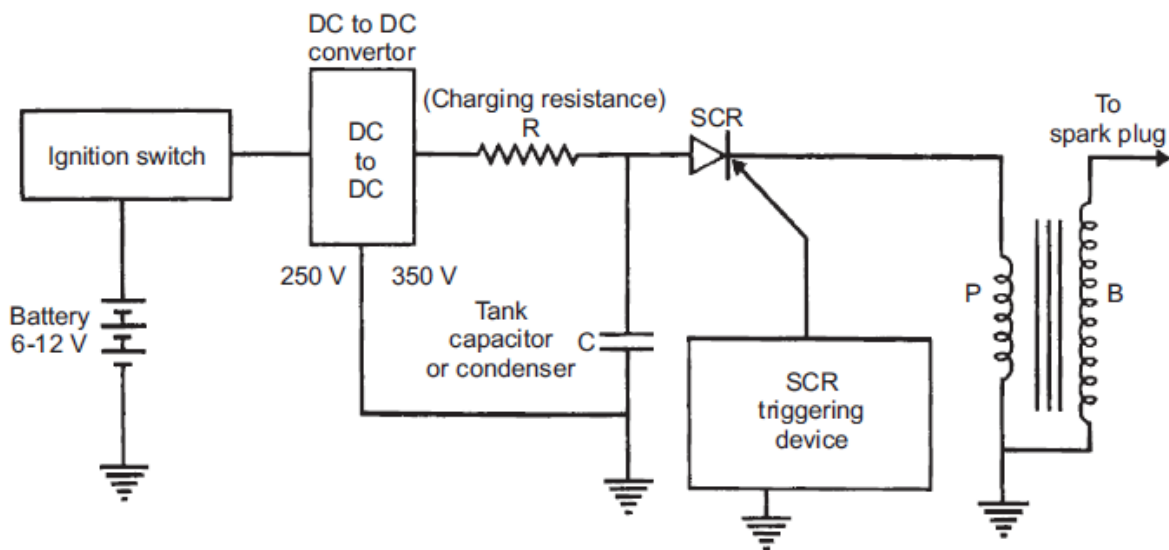
06

**Answer: Working of CDI system:**

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.

04

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.



02

Fig. Capacitance Discharge Ignition System

OR

CDI system consists of primary circuit and secondary circuit

**The primary circuit consists of following components:**

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

04

WINTER- 14 EXAMINATION

Subject Code: 17521

Model Answer

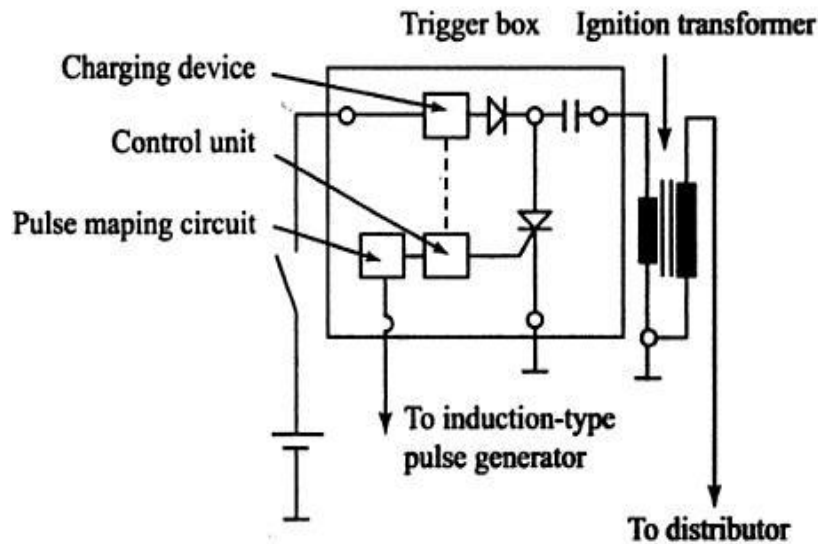
Page No: 6/28

**The secondary circuit consists of following components:**

- 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*

*Note: Any suitable figure shall be considered.*

2. Attempt **any four** of the following

02

- a) Which type of clutch is commonly used in motor cycle? Justify your answer with suitable example.

16

04

Answer:

**Multi- plate Wet type clutch** is most commonly used in motor cycle because of following reasons-

01

1. Multi-plate clutch is very compact, occupy less space and transmits more torque. In motorcycle, space available to locate the clutch is small and clutch is enclosed in a cover.
2. With multiple plates, surface strength and friction in engaged clutch are increased.
3. Depending upon the power output of the engine and weight of two wheeler, 4 to 8 sets of plates are required and assemble in single cover.
4. The clutch plates and friction plates are immersed in oil bath, hence known as wet clutch and operate smoothly.
5. Oil helps the clutch to run cool. Debris resulting from clutch wear can be drain easily with oil.
6. This type of clutch has more life and depends upon the quality of oil used.

03



WINTER- 14 EXAMINATION

Subject Code: 17521

Model Answer

Page No: 7/28

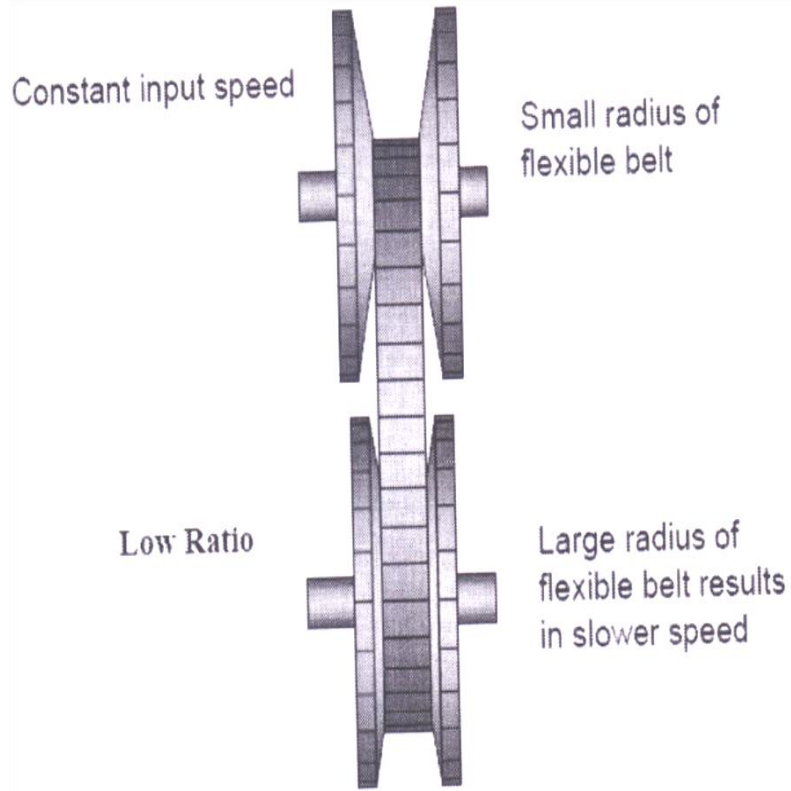
|  |    |
|--|----|
| b) Describe the working of carburetor under following operating conditions:<br>i) Idling ii) Starting iii) Acceleration iv) Normal running   | 04 |
| Answer:<br>i) Idling :<br>A <b>separate idling and low speed passage</b> is provided with low speed port and idle port. For idling rich mixture is required in small quantity the throttle valve is almost closed. The whole of engine suction is now applied at the idle port through which air and fuel are drawn, giving rich mixture.  | 01 |
| ii) Starting :<br><b>Choke</b> is used for starting. It is mounted eccentrically which facilitates its automatic opening after the engine has started as the choke valve is closed, whole of engine suction is applied at the main nozzle, which then delivers fuel. As the <b>air flow is quite small, the mixture supplied is very rich.</b>   | 01 |
| iii) Acceleration:<br>When acceleration is desired the accelerator twist grip is twisted, which actuate <b>the main jet giving an extra supply of fuel for acceleration.</b> It must be clear that the purpose of accelerating circuit is not to provide a continuous fuel supply for acceleration, but only to provide extra supply of fuel to avoid flat spot.   | 01 |
| iv) Normal running:<br>The throttle is held partly opened so that engine suction is now applied at the main jet, which now supplies the fuel. <b>The air enters directly through the venturi; the quantity of mixture is controlled by throttle valve.</b>   | 01 |
| c) State advantages of gas filled shock absorber used at rear end.   | 04 |
| Answer: <b>Advantages of gas filled shock absorber</b> used at rear end- <i>(Any four points -1 Mark each)</i><br>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.<br>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.<br>3. The tolerance to heat in gas filled shock absorber is greater.<br>4. Gas filled shock absorber give longer life to tyres and other related components in the suspension such as springs, brushes etc.<br>5. A gas filled shock absorber is designed to reduce foaming of the oil.   | 04 |
| d) State the criteria for selection of wheels and tyres for motorcycle and scooter.  | 04 |
| Answer: <b>Criteria for selection of a tyre:</b> <i>(Any four points)</i><br>1. <b>Performance and efficiency:</b> A tyre should give good performance in rain, cold/ hot weather, on different road surfaces. It should provide very good fuel economy by offering lower rolling resistance.<br>2. <b>Cost:</b> A tyre should have low cost.<br>3. <b>Road Grip:</b> It should have a very good grip of road surface on hot/ cold/ wet/ dry/ gravel road surface while travelling straight or cornering.<br>4. <b>Comfort:</b> It should provide a comfortable ride to the rider and pillion rider<br>5. <b>High speed stability:</b> A tyre should provide better high speed stability.<br>6. <b>Handling characteristics:</b> A tyre should provide better cornering behavior.<br>7. <b>Durability:</b> it should have long life.<br>8. <b>Cushion:</b> It should provide adequate cushion against road shocks.<br>9. <b>Temperature:</b> it should have a characteristic by which the tyre for specific application, will quickly reach optimal operating temperature to provide proper road grip and performance.<br>10. <b>Tread Depth:</b> It should provide adequate tread depth as per application. | 04 |

WINTER- 14 EXAMINATION

Subject Code: 17521

Model Answer

Page No: 8/28

|   |    |
|---|----|
| e) Describe the use of Jacket and Helmet as a safety concern.   | 04 |
| <p>Answer: Use of Jacket and Helmet as a safety concern:</p> <p><b>1. Jacket-</b><br/>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.</p> <p><b>2. Helmet:</b><br/>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.</p> | 02 |
| 3. Attempt <b>any four</b> of the following :   | 16 |
| a) Describe construction and working of vario- drive used in mopeds.  | 04 |
| <p>Answer: <b>Construction and working of vario - drive used in mopeds:</b></p> <div data-bbox="386 1108 1172 1894" data-label="Diagram">  </div> <p>Figure: Pulley based vario drive arrangement</p>   |    |



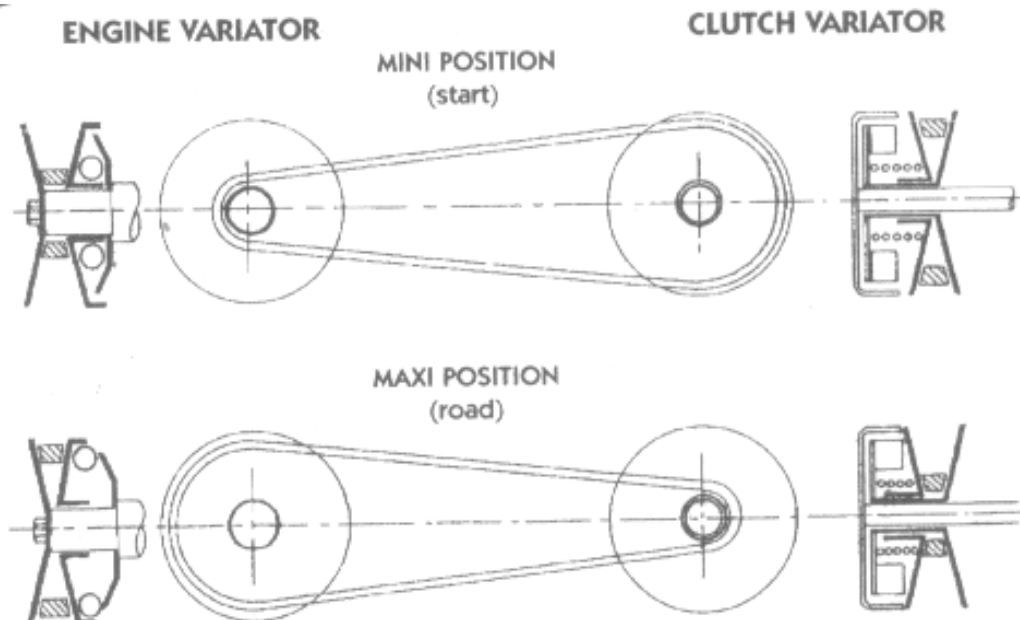
WINTER- 14 EXAMINATION

Subject Code: 17521

Model Answer

Page No: 9/28

OR



**Construction:** Vario- drive consists three basic components- A high power metal or rubber belt, A variable input driving pulley which is connected to the crankshaft of the engine, output driven pulley which transfers energy to the drive shaft. Each pulley is made of two 20 degree cones facing each other. A belt rides in the groove between the two cones. This assembly has rollers which move in and out depending on the load condition and engine rpm giving the differential pulley diameter thus providing the optimum wheel rpm and traction force V belts are preferred if the belt is made of rubber.

02

**Working:** When the two cones of the pulley are far apart (When the diameter increases) the belt rides lower in the groove and the radius of the belt loop going around the pulley gets smaller. When the cones are close together (when the diameter decreases), the belt rides higher in the groove and the radius of the belt loop going around the pulley gets larger. CVTs may use hydraulic pressure, centrifugal force or spring tension to create the force necessary to adjust the pulley halves.

02

(Note: Construction - 2 marks, working - 2 marks) Weightage may be given to figure for showing construction of vario drive)

b) State types of muffler. With neat sketch explain working of any one type.

04

Answer: (Types -02 marks, Explanation of any one type -02 marks)

Types of muffler: (Any four)

1. Baffle type
2. Wave cancellation type
3. Resonance type
4. Absorber type
5. combined resonance and absorber type

02

**1. Baffle type muffler :**

It consists of number of baffles spot welded inside the cylindrical body. The purpose of these baffles is to close direct passage of exhaust gases, thus the gases travels a longer path in the muffler. There are many designs of baffles used in the muffler. Figure shows two types of such muffler. The measure drawback of this type muffler is its low efficiency. Due to the restricted flow of exhaust gases, back pressure increases causing the loss of engine HP.

02

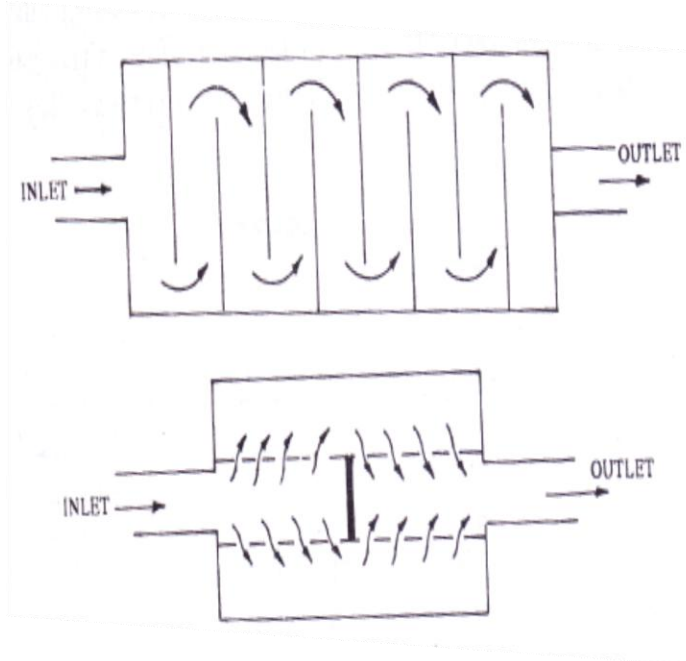


Figure: Baffle type muffler

**2. Wave cancellation type muffler:**

In this type of muffler the exhaust gases entering the mufflers are divided into two parts to flow in the muffler. The lengths of these paths are so adjusted that after they came out of muffler, crests of one wave coincide with the trough of the second wave, thus the cancelling each other & reducing the noise to zero theoretically. This is achieved if the length of two paths differs by half the wavelength. But this is not practically achieved because the noise created by exhaust gases is combination of different frequencies at the different engine speeds. However appreciable noise is reduced.

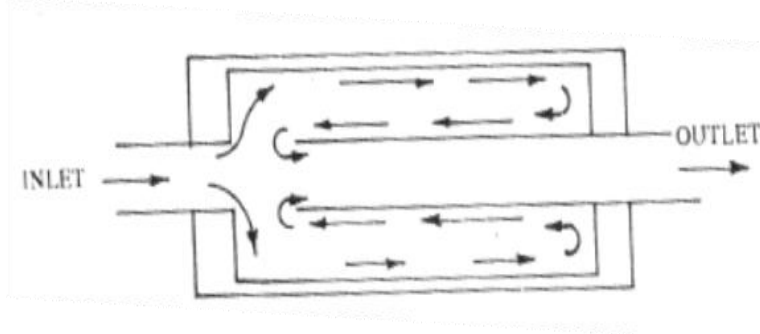


Fig : Wave cancellation type muffler

WINTER- 14 EXAMINATION

Subject Code: 17521

Model Answer

Page No: 11/28

**3. Resonance type muffler:**

It consists of a number of Helmholtz resonators in series through which a pipe having access port passes. Helmholtz is the name of a person who originated the idea of this type of muffler. The exhaust gases flow through this pipe. The resonators eliminate the fundamental and higher harmonics of the engine noise.

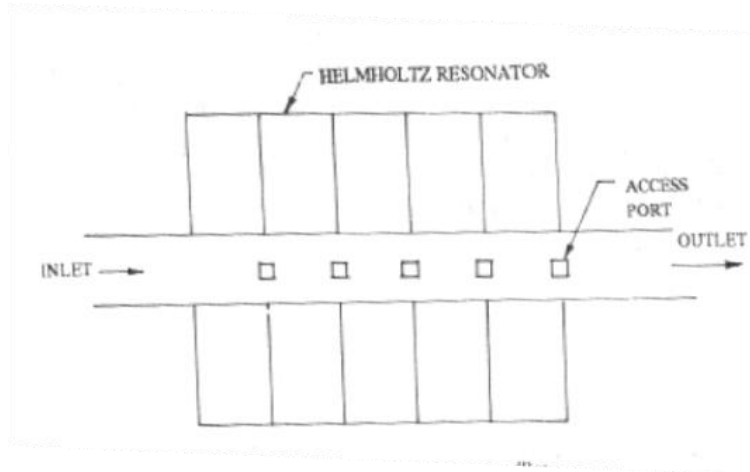


Fig: Resonance type muffler

**4. Absorber type muffler:**

It consists of a perforated tube, around which a sound absorbing material, like fiber glass or steel wool, is placed. The exhaust gases pass through the perforated tube. The sound absorbing material reduces the high pressure fluctuation of the exhaust gases thus reducing the noise intensity. These mufflers may be either straight through type or reverse flow type as shown in figure.

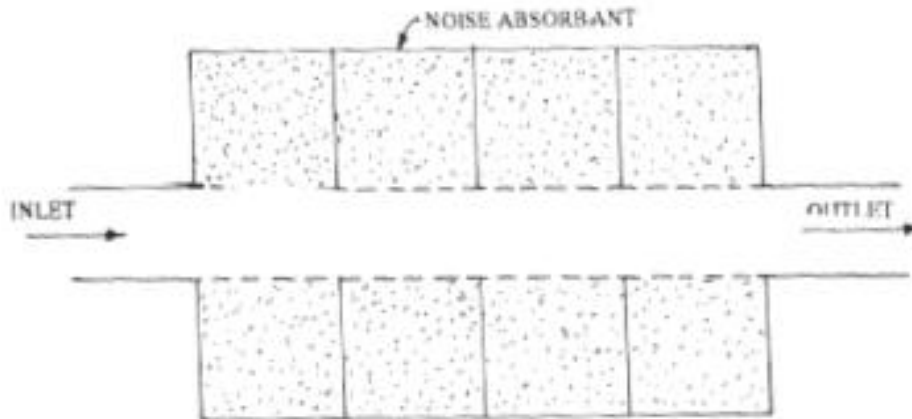


Fig : Reverse flow Absorber type muffler

WINTER- 14 EXAMINATION

Subject Code: 17521

Model Answer

Page No: 12/28

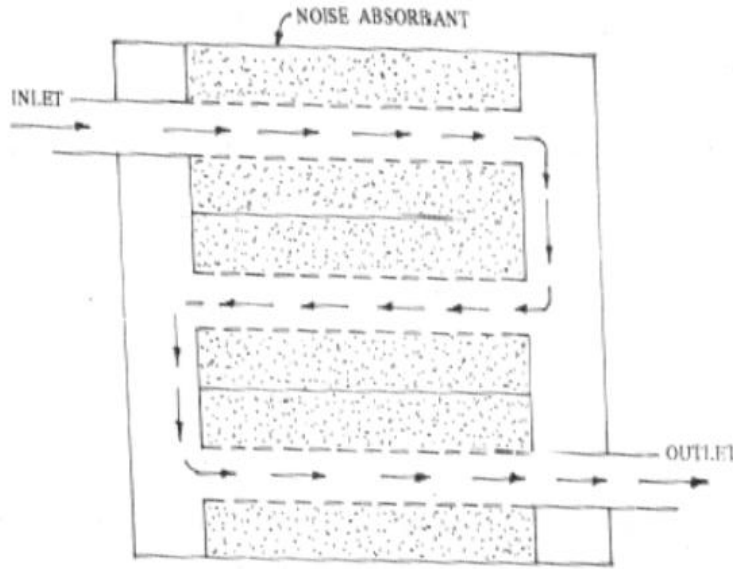


Figure: Straight through Absorber type muffler

**5. Combined resonance and absorber type muffler:**

Sometimes a resonance chamber is provided at one end or in the middle of the straight through absorber type muffler to reduce the pressure and noise still further. In some designs, the resonance chamber is a separate unit called a resonator, which connected in series to the muffler.

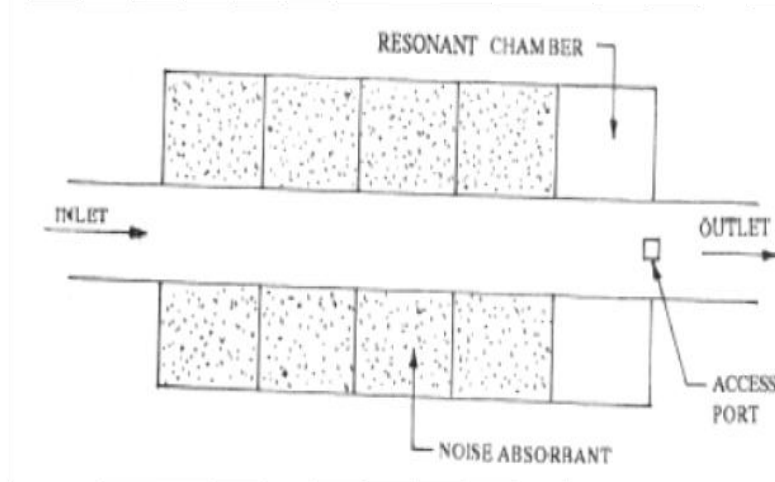


Figure: Combined resonance and absorber type muffler

c) Sketch and describe handle bar arrangement.

04

**Answer: Handle Bar Arrangement:**

A motor cycle fork connects a motorcycle's front wheel and axle to its frame, typically via a pair of triple clamps. It typically incorporates the front suspension and front brake, and allows the bike to be steered via handlebars attached to the top clamp.

The handle bar arrangement gives rider a proper leverage to make the front wheel as his wish or as he required. It provides convenient mounting place for manually operated controls. The handle bar is made in different shapes and design keeping in mind the rider's comfort and different views. In motorcycles the handle bar is directly mounted on the front fork and it is made out of rigid steel pipe. The handle bar is fitted with

02

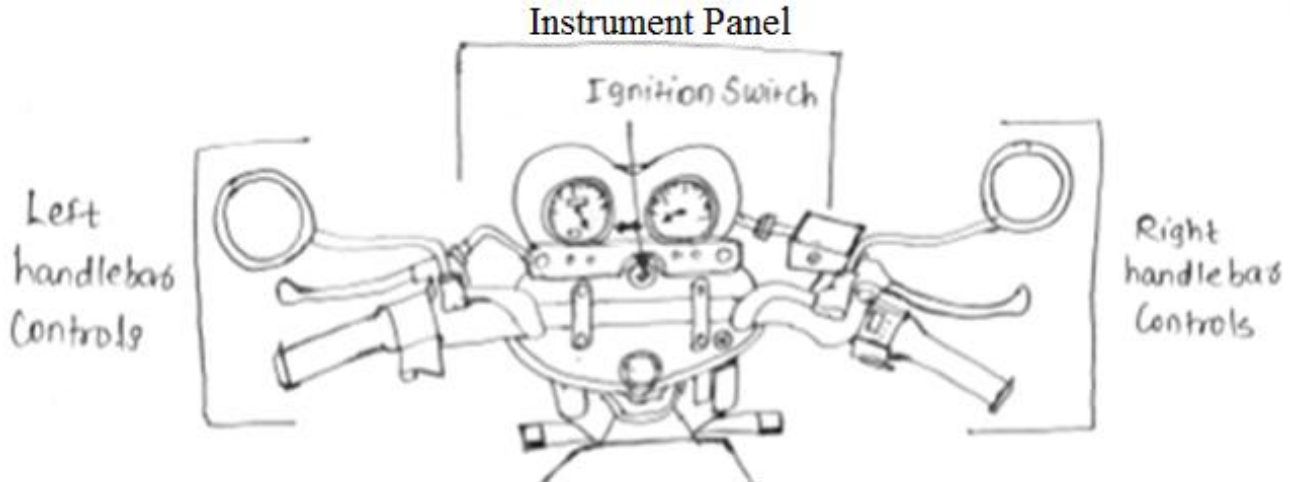
WINTER- 14 EXAMINATION

Subject Code: 17521

Model Answer

Page No: 13/28

controlled sleeves and handgrip on both sides. In scooters the handle bar is made of light alloy sheet by pressing with provision for head lamp and speedometer. All controls cables and electric wires connected to handle bar.

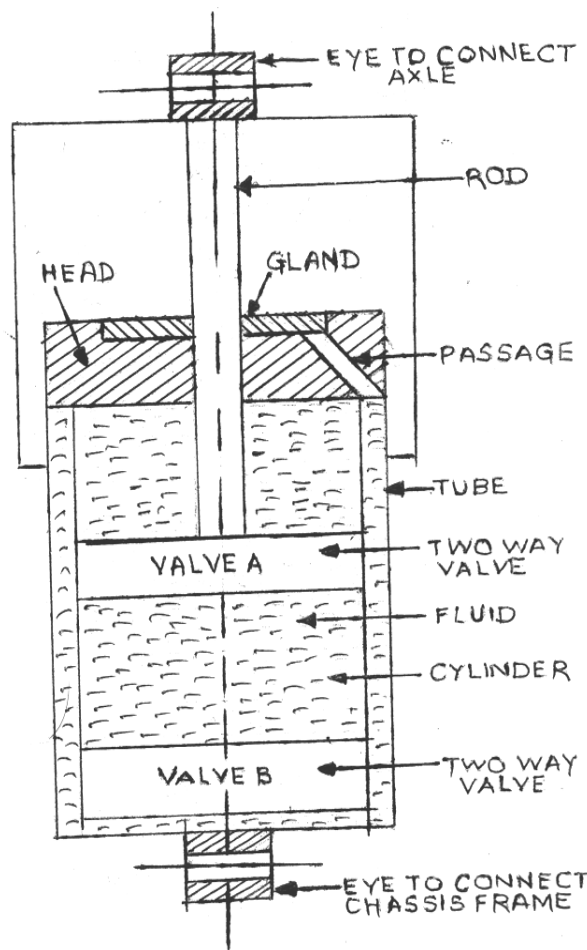


02

d) Describe the working of double acting type shock absorber.

04

Answer: **Working of double acting type shock absorber:**



02

Figure: Double Acting type hydraulic shock absorber



WINTER- 14 EXAMINATION

Subject Code: 17521

Model Answer

Page No: 14/28

**Working:** When the vehicle comes across a bump the lower eye moves up. Therefore the fluid passes from the lower side of the valve A to its upper side but since the volume of the space above valve A is less than the volume of the rod the fluid exerts pressure on the valve B. This pressure of the fluid through the valve opening provides the damping force. Similarly when the lower eye moves down the fluid passes from the upper side of the valve A to the lower side and also from the lower side of the valve B to its upper side.

02

e) Compare drum brake with disc brake ( four points)

04

Answer: **Comparison of drum brake with disc brake:** (Any four points)

| Sr. No. | Drum brake   | Disc brake   |
|---------|--|--|
| 1.      | Friction occurs on the internal surfaces therefore heat dissipated only by conduction through the drum | Frication surfaces are directly exposed to the cooling air.      |
| 2.      | Curved frication pads are used   | Flat frication pads are used                                     |
| 3.      | Non uniform wear of frication 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                                       |

04

f) Explain the effect of following on aesthetics of motorcycle:

- i) Ground clearance
- ii) Shape and position of mudguard.

04

Answer:

- i) **Ground clearance:** Ground clearance is the distance between any lowest part of vehicle and the ground, when both the tyres are in contact with the ground and inflated to correct tyre pressure. The aesthetics look & ground clearance of motor cycle depends upon the requirement of customer as well as manufacturer. As per type of two wheeler, (sports/off road bike) the ground clearance may differ. The high or low ground clearance affects the aesthetics of motorcycle. 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. The ground clearance is providing adequate height to the seating position of rider.
- ii) **Shape and position of mudguard:** It is used for styling and eye catching looks. It also gives the sporty styling. It improves the personality of rider. The combination of black and chrome styling gives better aesthetics look. Mud guard can be large rectangular sheets suspended behind the tires. It protects the vehicle, passengers, other vehicles from mud and other flying debris thrown into the air by the rotating tyres.

02

02

4. A) Attempt **any Three** of the following :

12

a) Draw a layout of mechanical brake and describe its working

04

WINTER- 14 EXAMINATION

Subject Code: 17521

Model Answer

Page No: 15/28

Answer: **Layout of mechanical brake:** (Note: Weightage may be given to any suitable diagram.)

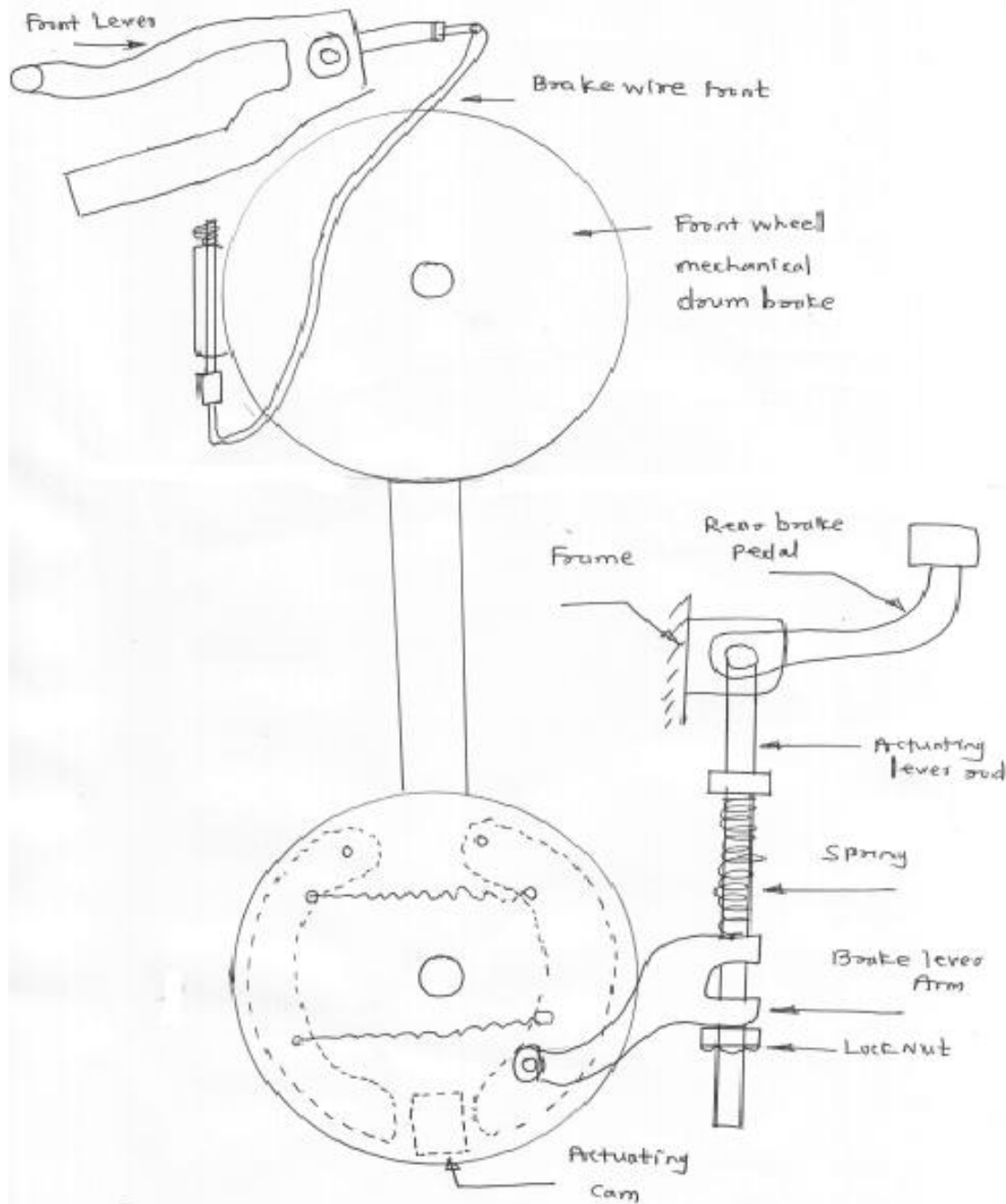


Figure: Layout of mechanical brake.

**Working:**

In case of motor cycle front brakes are operated by brake lever which is present on left side of handle bar. A brake wire is connected through a slot on brake lever to the front brake lever arm. This is outside the brake drum. When we press brake lever the cam or toggle is actuated through brake cable. In this way the brake shoes are engaged with brake drum and brakes are applied.

Motor cycle rear brakes are operated by pressing the brake pedal which is situated at the bottom side and attached to the frame by means of pivot & fulcrum. It is actuated with the help of a rod & linkages.

02

02



WINTER- 14 EXAMINATION

Subject Code: 17521

Model Answer

Page No: 16/28

|  |                  |
|--|------------------|
| b) What is DTSi System? State its two benefits   | 04               |
| Answer:<br><b>DTSi system</b> stands for Digital Twin Spark Ignition system. In digital Twin Spark Ignition system, engine has twin or two spark plugs and the ignition timing is digitally mapped on the microprocessor chip provided in the CDI unit. The spark plugs located at opposite ends of the combustion chamber and hence fast & efficient combustion is obtained.  | 02               |
| <b>Benefits-</b> (Any two)<br>1) The microprocessor memory chip manages accurate ignition timing at all level of engine load and speed with respect to engine rpm. This optimizes power and lead to better derivability.<br>2. The twin spark plugs introduce spark simultaneously in the combustion chamber and improvises combustion process, which leads to low emissions, better fuel efficiency and minimizes knocking drastically.<br>3. This system can adjust idling speed & even cuts off fuel feed when acceleration grip is released and meters the enrichment of the air – fuel mixture for cold starting and accelerating purposes.<br>4. Less vibration and noise<br>5. Long life of the engine parts such as piston ring and valve stem<br>6. Decreases in the specific fuel consumption<br>7. No overheating.<br>8. Increase the thermal efficiency of engine and even bear high load on it. | 02               |
| c) State the purpose of :<br>i) High beam indicator lamp<br>ii) Turn signal lamp<br>iii) Speedometer lamp<br>iv) Trip meter  | 04               |
| Answer: <b>The purpose of:</b><br><b>i) High beam indicator lamp-</b> It illuminates the road far enough ahead for safe night driving. It should be adjusted vertically as per the requirement of visibility of the rider. Use your high beam whenever you are not following or meeting a car.<br><b>ii) Turn signal lamp-</b> it is a safety device. It is used to indicate the direction of the vehicle like left & right side. While driving on road, It gives informative signal (illumination light or flash) to the other vehicles. Turning your signal light on before each turn reduces confusion and frustration for the traffic around you<br><b>iii) Speedometer lamp-</b> It indicates the kilometer per hour of forward speed.<br><b>iv) Trip meter-</b> It is used to record distance covered in a trip or tour. Also helps in calculating mileage.  | 1<br>1<br>1<br>1 |
| d) State the merits and demerits of kick start and button start systems.   | 04               |
| Answer:<br><b>Merits of Kick start mechanism</b><br>1. It is reliable and useful in all climatic conditions.<br>2. It is cheaper or less expensive.<br>3. It is maintenance free due to absence of battery, starter motor and electrical switches.   | 1                |





WINTER- 14 EXAMINATION

Subject Code: 17521

Model Answer

Page No: 17/28

|   |    |
|---|----|
| <p><b>De-Merits of Kick start mechanism</b></p> <ol style="list-style-type: none"> <li>1. Kick start mechanism is tiresome operation-requires physical or manual force to start the engine</li> <li>2. In case of high compression vehicle, back kick problem arises so it could damage the leg.</li> <li>3. It is difficult to start the vehicle in cold conditions</li> </ol>   | 1  |
| <p><b>Merits of self start mechanism</b></p> <ol style="list-style-type: none"> <li>1. It doesn't require any type of physical or manual force.</li> <li>2. To start a vehicle, it is very easy. We can start motor cycle in any gear.</li> <li>3. Easy access and start at inconvenience place like, hill gradient, slippery surface</li> </ol>  | 1  |
| <p><b>De-Merits of self start mechanism</b></p> <ol style="list-style-type: none"> <li>1. It involves number of components, like battery, self starter, so the cost of motor cycle increases</li> <li>2. Regular maintenance is required</li> <li>3. Starting of vehicle is depends upon the condition of battery so it is necessary to use the vehicle regularly to charge the battery</li> <li>4. Require more space and complicated construction.</li> </ol> | 1  |
| B) Attempt <b>any one</b> of the following :  | 06 |
| a) Draw a neat sketch of catalytic converter and describe its construction and working.   | 06 |
| Answer- ( <i>Sketch-02 construction-02 working-02</i> )   |    |
| <p><b>Three Way Catalytic Converter:</b><br/><b>Construction:</b><br/>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 &amp; rhodium as catalysts.</p>   | 02 |
| <p><b>Working:</b><br/>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...8000C provide ideal conditions for maximum efficiency and extended service life.</p>  | 02 |
| <p><b>Catalyst Reduction</b><br/>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.</p>  |    |
| <p><b>Catalyst Oxidation.</b><br/>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 (H<sub>2</sub>O) and carbon dioxide (CO<sub>2</sub>).</p>  |    |

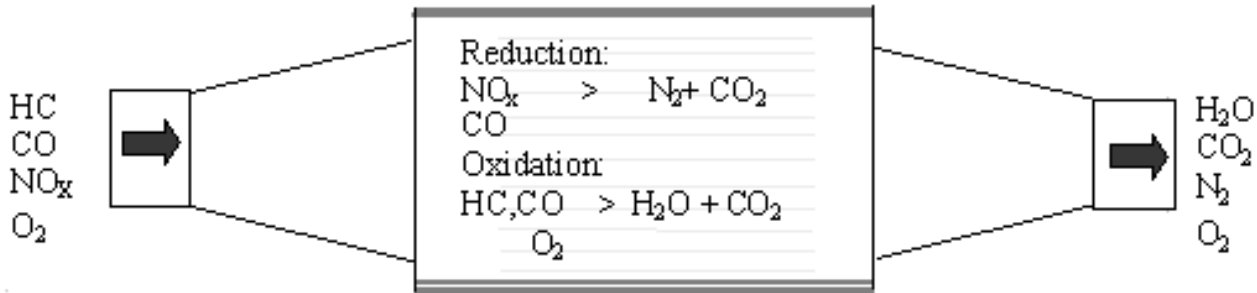
WINTER- 14 EXAMINATION

Subject Code: 17521

Model Answer

Page No: 18/28

Three Way Catalytic Converter



02

OR

**Two Way Catalytic Converter:**

**Construction:**

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.

02

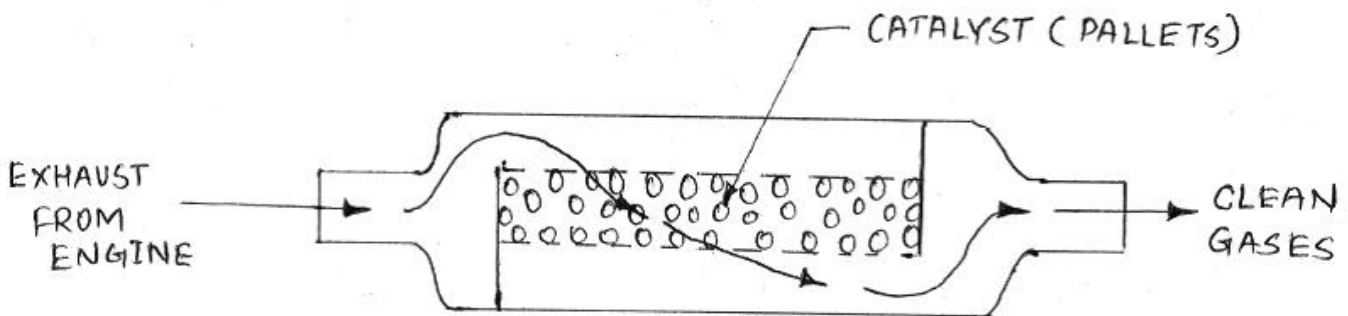
**Working:**

A two way catalytic converter has two simultaneous task:

- 1) Oxidation of carbon monoxide to carbon dioxide:  $2\text{CO} + \text{O}_2 \rightarrow 2\text{CO}_2$
- 2) Oxidation of unburnt hydrocarbons (unburnt & partially burnt fuel) to carbon dioxide & water:  $2\text{C}_x\text{H}_y + (2x + y/2)\text{O}_2 \rightarrow 2x\text{CO}_2 + y\text{H}_2\text{O}$

02

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



02

FIG: Catalytic Converter

WINTER- 14 EXAMINATION

Subject Code: 17521

Model Answer

Page No: 19/28

b) Draw a circuit diagram of two wheeler charging system showing AC and DC circuits and label it.

06

Answer: **Circuit diagram of two wheeler charging system:** (Neat appropriate diagram with correct labeling)

06

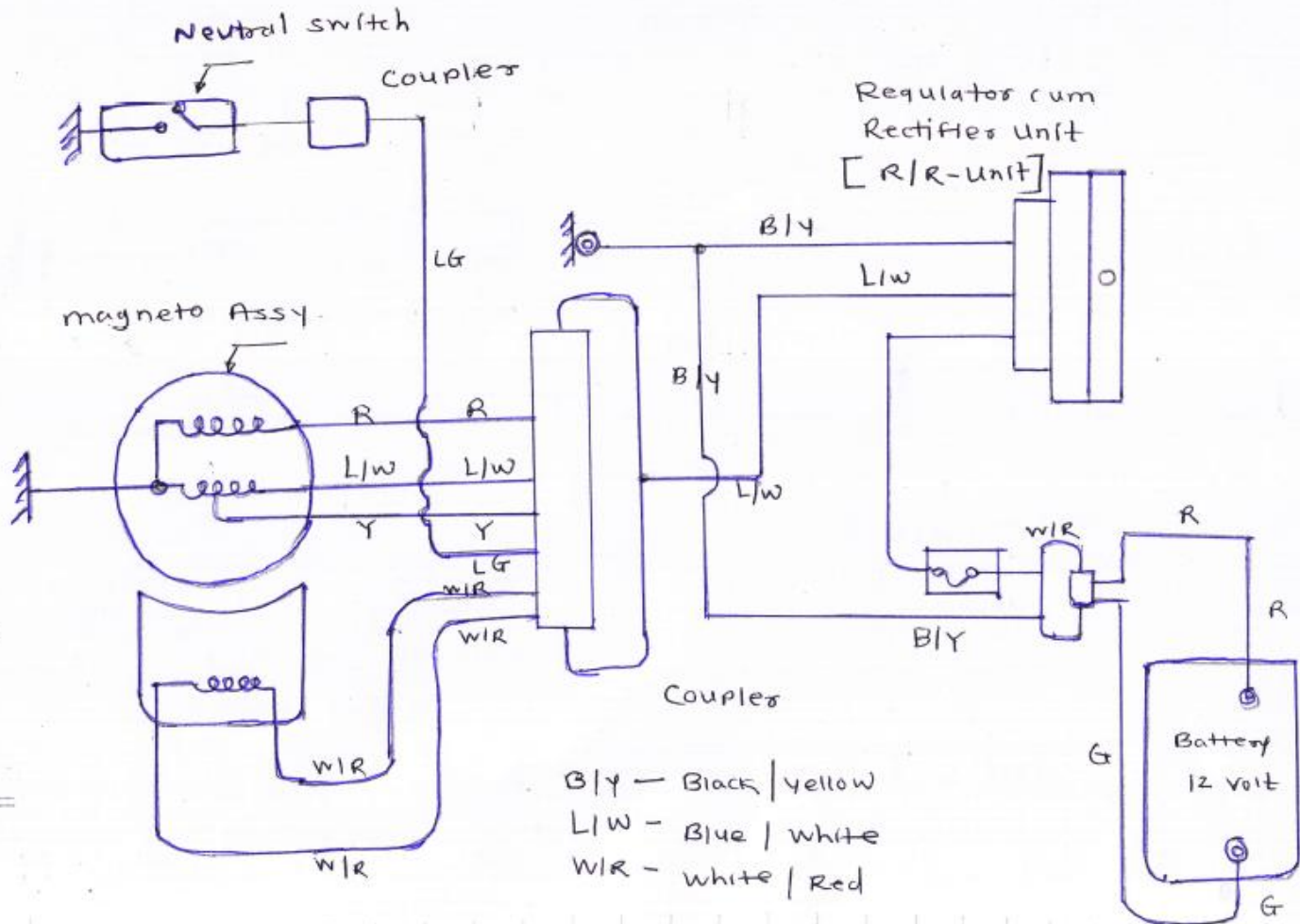


Figure: Circuit diagram of two wheeler charging system showing AC and DC circuits

5. Attempt **any four** of the following :

16

a) Compare two wheeler gear box with four wheeler gear box ( four points)

04

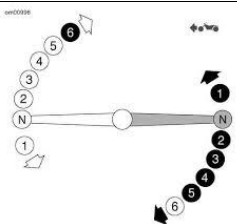
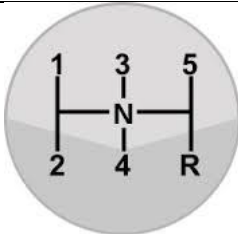
**WINTER- 14 EXAMINATION**

Subject Code: **17521**

**Model Answer**

Page No: 20/28

**Answer: Comparison of two wheeler gear box with four wheeler gear box (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 unsynchronized 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       | Size                                   | Small.  | Large.  |
| 6       | Cost                                   | Low cost due to absence of synchronizer.  | High cost due to use of synchronizer.   |
| 7       | Weight                                 | Lighter   | Heavier   |
| 8       | Maintenance                            | Less maintenance  | More maintenance: Due to complicated dog shift arrangement. : Synchronizer cones may need replacement.                        |
| 9       | Lubrication                            | Uses engine oil as lubricant for gearbox. (SAE 30W40)   | Uses separate oil as lubricant. (SAE 90)  |
| 10      | Symbolic presentation of gear shifting |    |   |

04

b) Describe construction and working of Air cleaner.

04

**Answer: Construction and working of Air cleaner:**

**Foam Type air cleaner:**

**Construction:**

It consists of filtering element which is made from a polyster or polyurethane low density sponge which has been impregnated with lubricating oil.

02

WINTER- 14 EXAMINATION

Subject Code: 17521

Model Answer

Page No: 21/28

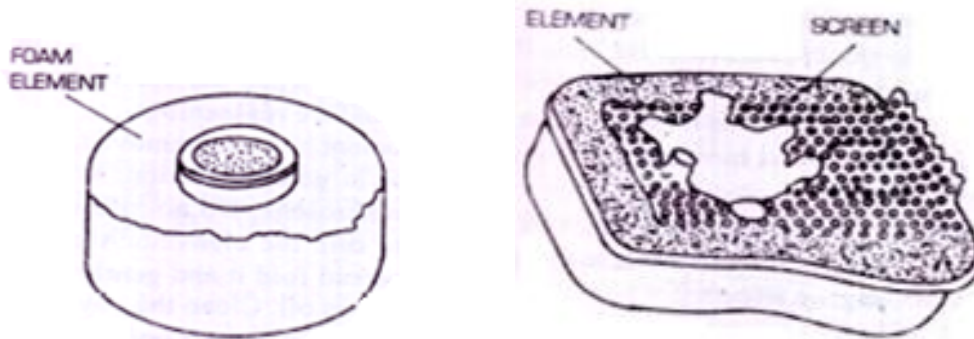


Fig: Foam Type air cleaner

**Working:**

Air passes through filter element, and dust particle of the air adheres to the oil film. The oil reduces the size of the tiny air passages in the sponge and provides a sticky retaining medium for the untrapped dust. This type of air cleaner should be cleaned periodically, about every 8000 km, by washing the wire mesh in petrol or paraffin. After drying it properly, coat it with engine oil, allow it to drain and again fit it for working.

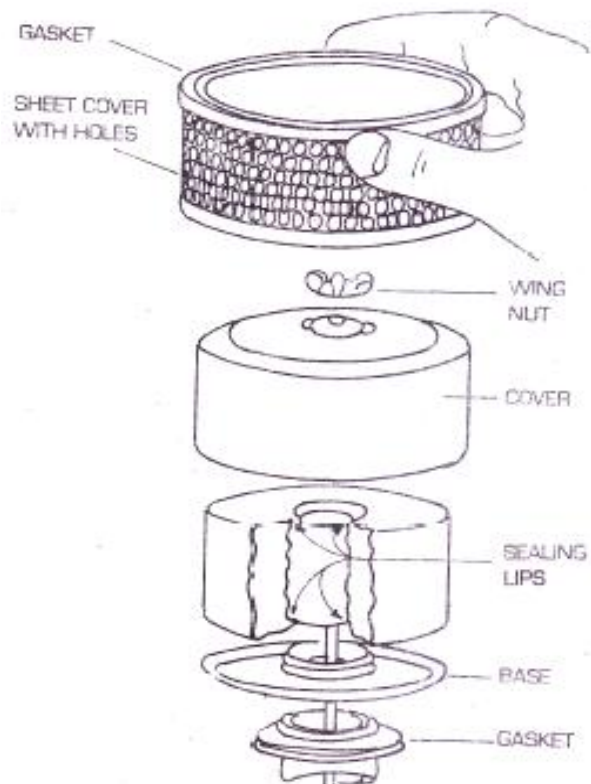
02

OR

**Dry Type air cleaner:**

**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.



02

Fig : Dry Type air cleaner

WINTER- 14 EXAMINATION

Subject Code: 17521

Model Answer

Page No: 22/28

**Working:**

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.

02

c) Describe working of microprocessor controlled ignition system.

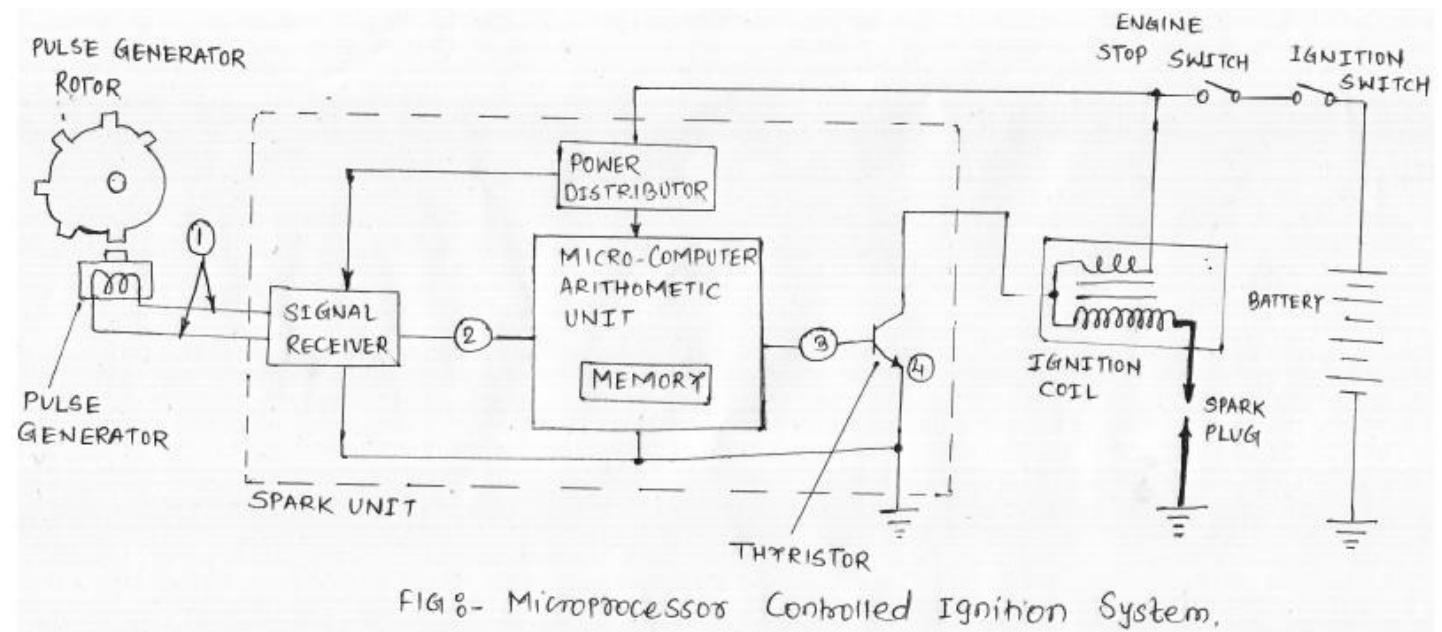
04

**Answer: Working of microprocessor controlled ignition system:**

This system digitally controls the ignition timing by a microcomputer inside the spark unit and calculates the ideal ignition timing at all the engine speed. The control unit consists of a distributor, a signal receiver which processes the pulse generator and a microcomputer which has a memory and an arithmetic unit. The circuit below is the ignition system of a 90° V – type 2 cylinder engine.

02

- 1 As the engine starts, a pulse signal from the pulse generator is sent to the spark unit.
2. The signal receiver converts the pulse signal to a digital signal and it is fed to the microcomputer.
3. As the microcomputer receives the digital signal, it processes signals containing information on the crankshaft angle and engine speed; the microcomputer then reads the information on ignition timing, which is based on the engine speed from its memory and determines the ignition timing. Then the microcomputer sends current to the base.
4. As the current from the microcomputer flows to the base of transistor, the transistor is turned ON, and ignites the spark plug.



02

OR

WINTER- 14 EXAMINATION

Subject Code: 17521

Model Answer

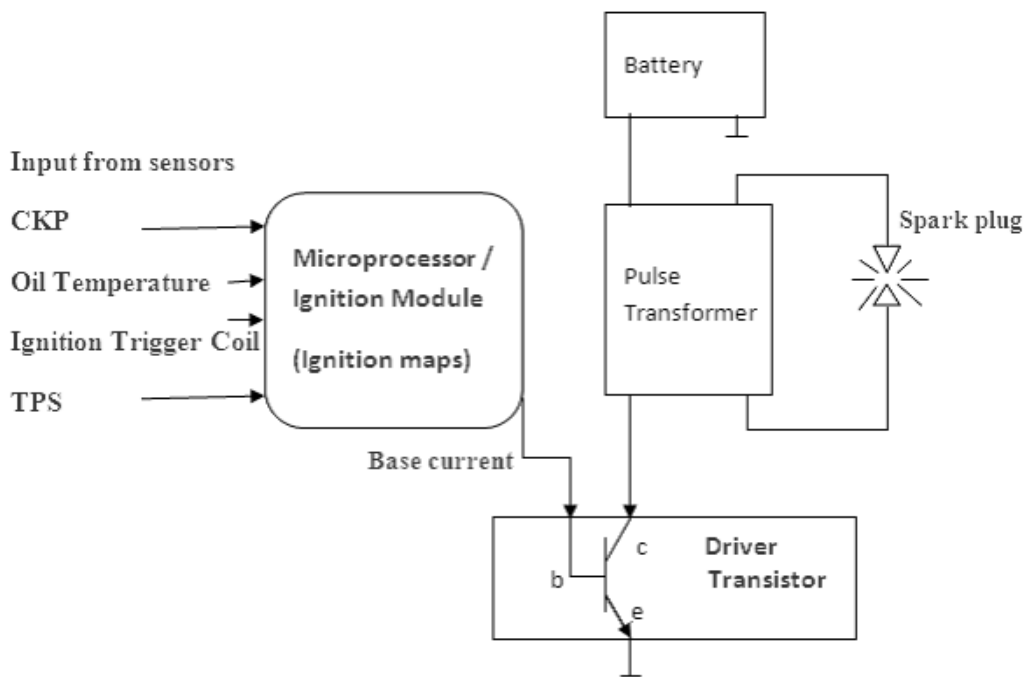
Page No: 23/28

The microprocessor controlled ignition system uses input from sensors like crankshaft position sensor, oil temperature sensor, ignition trigger coil and throttle position sensor. The ignition module/ microprocessor uses ignition maps to trigger the driver transistor for optimum spark timing. It uses a pulse transformer (a type of ignition coil) having low inductance. As the trigger coil generates a signal/ pulse – it is sent to the microprocessor. Microprocessor switches on the driver transistor by supplying base current. Now the collector emitter circuit of the driver transistor carries the primary circuit current to ground.

02

Primary current flow causes magnetism to be induced in secondary winding as well (primary and secondary windings are wound around the same iron core of ignition coil). A high voltage is induced in the secondary winding of pulse transformer. This voltage is sufficient to ignite the leanest charge in combustion chamber. The ignition maps stored in the ignition module / microprocessor enables the spark to be timed accurately.

**Microprocessor controlled ignition system:**



02

d) Describe effect of following on aerodynamics of motorcycle :

- i) Shape of headlamp
- ii) Shape of fuel tank

04



WINTER- 14 EXAMINATION

Subject Code: 17521

Model Answer

Page No: 24/28

Answer: **Effect of following on aerodynamics of motorcycle :**

**i) Shape of headlamp:**

The headlamp is available in different shapes; it is depending on the type of manufacturer or type of vehicle. For example

1. In motorcycle it is separately placed at the centre of handle bar.
2. In case of scooters the head lamp is inbuilt in the handle bar arrangement.

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.

02

**ii) Shape of fuel tank:**

The shape of fuel tank in motorcycle provides the following.

1. It holds adequate fuel as per class of motorcycle.
2. Generally the fuel tank shape is a tear drop design. It offers least aerodynamic drag.
3. Its shape allows the rider's knees to be included within the contour of front end of vehicle. i.e. the rear end of fuel tank is narrower. This also reduces air drag.
4. Appropriately positioned handlebar with adequate handlebar width allows rider to lean forward and reduce air drag. If the driver lies on the fuel tank, then he experiences less of parachute effect. i.e. the vehicle is not slowed down due to aerodynamic drag.
5. Its shape accommodates the frame tube and allows fuel to be stored at a lower height to slightly reduce the height of the center of gravity of motorcycle.
6. Space is ensured for handlebar turning through the required angle.

02

e) Explain ergonomic effects of

- i) Handle bar position
- ii) Raised seat at rear end

04

Answer: **Ergonomic Effects of:**

**i) 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.

02

**ii) Raised seat at rear end:**

It is more convince to both rider & pillion rider to seat for long trip or tour. The taper 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.

02





WINTER- 14 EXAMINATION

Subject Code: 17521

Model Answer

Page No: 25/28

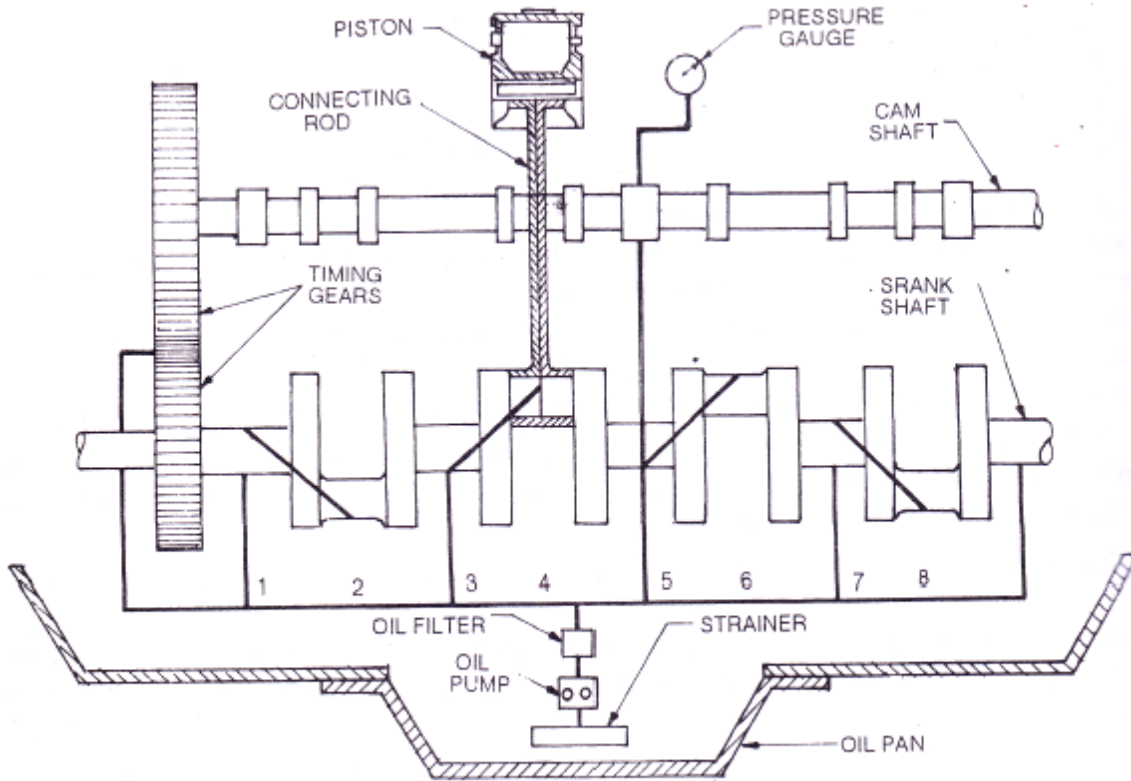
|   |    |
|---|----|
| 6 Attempt <b>any four</b> of the following :  | 16 |
| a) Describe the use of<br>i) Horns<br>ii) Reflectors in head lamp and tail lamp   | 04 |
| Answer:<br><b>i) Use of Horns</b> - Horns is a sound creating device electrical horns are used in all the automobile vehicles<br>1. When the horns is operated is create loud vibrating sound indicating that vehicle is coming so that the passengers or the other slow moving vehicles may clear off the path to pass.<br>2. Lights breaks & horns are the devices that prevent accident. Horns are included in safety device.<br>3. Horns are also used as a calling bell to call the person when vehicle is ready to start.   | 02 |
| <b>ii) Use of Reflectors in head lamp and tail lamp</b> - Reflectors are used in head light assembly and tail lamp, concave in shape or parabolic. Reflector is portion which coated by aluminum / mercury powder coating on a concave fiber or metallic part. 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.  | 02 |
| b) Describe with sketch wet sump pressurized lubrication system in four strokes.  | 04 |
| Answer:<br><b>Wet sump pressurized lubrication system:</b><br>The system in which lubricating oil is stored in the oil sump is called wet sump system, like pressure lubricating system. In this system, the engine parts are lubricated under pressure feed.<br><br>The lubricating oils is stored in a separate tank or the sump from where an oil pump takes the oil through a strainer and delivers it through a filter to the main oil gallery at a pressure to 2-4 kg/cm <sup>2</sup> . The oil from the main gallery goes to main bearings from where some of it after lubricating the main bearing falls back to the sump, some is splashed to lubricate the cylinder walls and the remaining goes through a hole to the crankpin. From the crank pin it goes the piston pin through a hole in the connecting rod web where it lubricates the piston rings.<br><br>For lubricating camshafts and timing gears the oils is led thought a separate oil line from the oil gallery.<br><br>The valve tappets are lubricated by connecting the main oil gallery to the tappet surfaces through drilled holes.<br><br>An oil pressure gauge at the instruments panel indicates the oil pressure in the system.<br><br>Oil filters and strainers in the systems clear off the oil from dust metal particles and other harmful particles. | 02 |

WINTER- 14 EXAMINATION

Subject Code: 17521

Model Answer

Page No: 26/28



*Pressure System of Lubrication*

02

c) State the conditions when kick starts and button starts methods are used. Justify your answer.

04

Answer:

1. In **cold start condition a kick start method** should be used instead of button start mechanism because to start the vehicle heavy amount of current is drawn from the battery which affects its life and performance.
2. In **hot start condition** battery is fully charged so that button start mechanism is easily operates and works, so self start mechanism is preferred.
3. **Kick start mechanism is reliable and long lasting** as compare to self start mechanism. So that vehicle performance is increased. Each and every vehicle is equipped with kick start mechanism.
4. **Kick start involve only mechanical components**, there is no need of external source such as battery therefore maintenance cost and vehicle cost is low as compare to button start vehicle.

04

d) State the purpose of providing

- i) Crash bar
- ii) Saree guard
- iii) Mudguard
- iv) Sealed beam- head lamp

04



WINTER- 14 EXAMINATION

Subject Code: 17521

Model Answer

Page No: 27/28

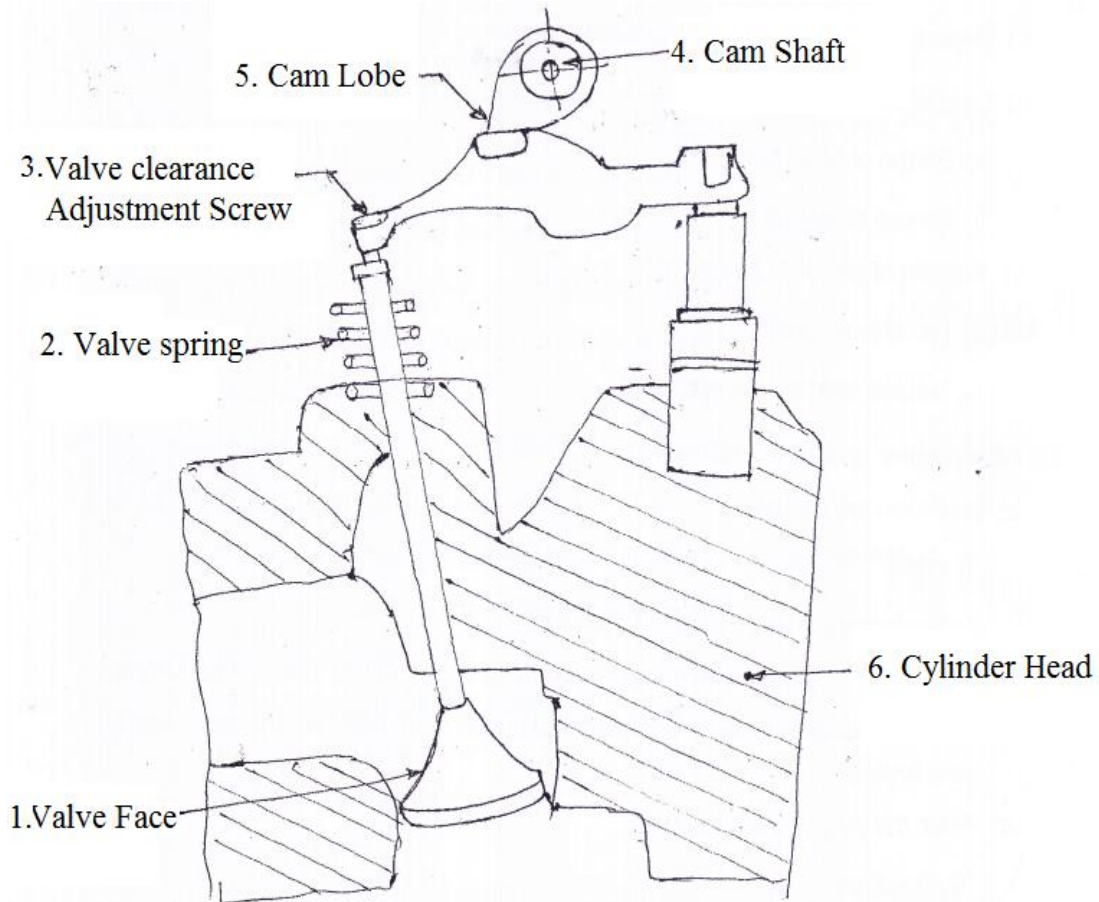
|   |                                     |
|---|-------------------------------------|
| <p>Answer: The purpose of-</p> <p>i) <b>Crash bar:</b> Crash bars aim to protect motorcycle engines and body panels as well as it is used to protect the rider. It is also used as a mount point for accessories like highway pegs, lights and, on police motorcycles, sirens, cameras and radar guns.</p> <p>ii) <b>Saree guards-</b> 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 &amp; 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.</p> <p>iii) <b>Mud guard-</b> It is used in combination with the vehicle fender to protect the vehicle, passengers, other vehicles, and pedestrians from mud and other flying debris thrown into the air by the rotating tire. Mud guard can be aerodynamically engineered, utilizing shaping, louvers or vents to improve airflow and lower drag.</p> <p>iv) <b>Sealed beam – head lamp:</b> Sealed beam head lamp means these are complete one assembly which covers head lamp, head lamp reflector and head lamp housing. These are closed with seals (i.e. (rubber packing/seals). It prevents air to be enter inside the head lamp housing which create air resistance. Air is prevented which contains dust particles affects on the life of head lamp reflector and head light glass.</p> | <p>1</p> <p>1</p> <p>1</p> <p>1</p> |
| <p>e) State four good driving habits to avoid accidents.</p>  | <p>04</p>                           |
| <p>Answer: Following are the <b>good driving habits to avoid accidents:</b> <i>(Any 4 points)</i></p> <p>i) To avoid low visibility the driver should wear clearly visible clothing.</p> <p>ii) At night driving the driver should not wear day night goggle.</p> <p>iii) Use safety devices for e.g. Helmet, jacket, shoes, hand gloves etc.</p> <p>iv) Use various indicators, horns; high and low beam lamps while driving.</p> <p>v) When applying the brakes, use both front and rear brakes.</p> <p>vi) The driver should maintain steady speed avoiding quick acceleration and sudden braking.</p> <p>vii) Always obey lane discipline</p> <p>viii) Drive vehicle in economy mode.</p>   | <p>4</p>                            |
| <p>f) Identify the system shown in fig. 1 Redraw and label the components shown by numbers.</p>   | <p>04</p>                           |
| <p>Answer: The figure given below indicates <b>Overhead Cam Arrangement.</b><br/><i>(Note: Identify the figure -1 mark, Redraw – 1 mark, correct labeling – 2 marks)</i></p>  | <p>1</p>                            |

WINTER- 14 EXAMINATION

Subject Code: 17521

Model Answer

Page No: 28/28



04