

USN



Internal Assessment Test 1 – March 2023

Sub:	Automobile Engineering				Sub Code:	18ME824	Branch:	ME		
Date:	11/03/2023	Duration:	90 min's	Max Marks:	50	Sem / Sec:	VIII/A&B	OBE		
<u>Answer any FIVE FULL Questions</u>								MARKS	CO	RBT
1	Explain dry liner and wet liners with neat sketches.					[10]	CO1	L2		
2	Explain any two valve actuating mechanism with a neat sketch.					[10]	CO1	L2		
3	Explain the objectives of lubrication in engine? Explain dry sump lubrication with a neat sketch.					[10]	CO1	L2		
4	Explain the disadvantages of air cooling? Explain pump circulation system cooling with a neat sketch.					[10]	CO1	L2		
5	Explain positive crankcase ventilation with a neat sketch.					[10]	CO5	L2		
6	Explain ECS for Fuel injected engines.					[10]	CO5	L2		
7	Explain EGR system with a neat sketch.					[10]	CO5	L2		

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**Scheme Of Evaluation**  
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**Note:** Answer Any Five Questions

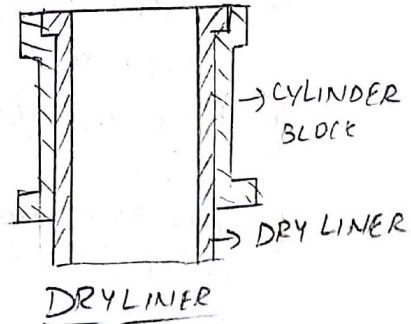
Question #		Description	Marks Distribution		Max Marks
1	a)	Explain dry liner and wet liners with neat sketches. <ul style="list-style-type: none"> <li>• Diagram</li> <li>• Explanation</li> </ul>	5 M 5 M	10 M	10 M
2	a)	Explain any one valve actuating mechanism with a neat sketch <ul style="list-style-type: none"> <li>• Diagram</li> <li>• Explanation</li> </ul>	5 M 5 M	10 M	10 M
3	a)	Explain the objectives of lubrication in engine? Explain dry sump lubrication with a neat sketch. <ul style="list-style-type: none"> <li>• Objectives</li> <li>• Diagram</li> <li>• Explanation</li> </ul>	3 M 3 M 4 M	10 M	10 M
4	a)	Explain the disadvantages of air cooling? Explain pump circulation system cooling with a neat sketch. <ul style="list-style-type: none"> <li>• Disadvantages of air cooling</li> <li>• Diagram</li> <li>• Explanation</li> </ul>	3 M 3 M 4 M	10 M	10 M
5	a)	Explain positive crankcase ventilation with a neat sketch. <ul style="list-style-type: none"> <li>• Diagram</li> <li>• Explanation</li> </ul>	5 M 5 M	10 M	10 M
6	a)	Explain ECS for Fuel injected engines. <ul style="list-style-type: none"> <li>• Diagram</li> <li>• Explanation</li> </ul>	5 M 5 M	10 M	10 M
7	a)	<ul style="list-style-type: none"> <li>• Explain EGR system with a neat sketch.</li> <li>• Diagram</li> <li>• Explanation</li> </ul>	2 M 2 M	10 M	10 M

## Liners (Sleeves)

Engineer makes use of removable liners which are pressed into cylinder holes. The cylinder liners are in the form of barrels & used to reduce the cylinder wear & hence increase bore life. When the liners wear out that can be replaced easily. It is made up of special alloy containing silicon, manganese, nickel & chromium.

There are 2 types of liners used

- ① Dry liners :- ① Dry liners are quite thin & use block metal to give it full length support. ② It is made in the form of barrel & both the surfaces must be

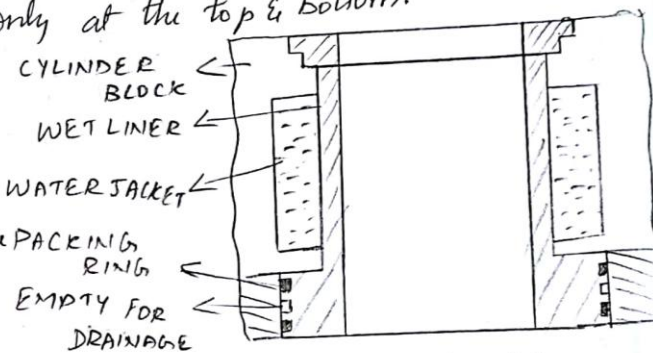


be machinized accurately to make complete contact with the cylinder block to dissipate the heat.

- ③ If it is fit loosely than it results in poor dissipation of heat then increases the operating temperature & results in piston scuffing.

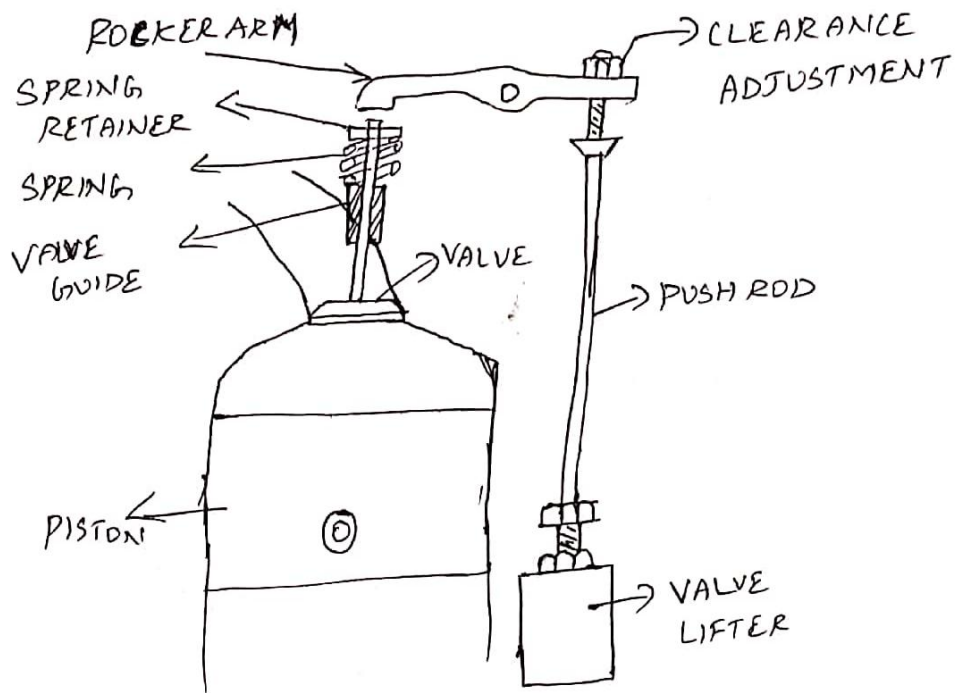
- ② Wet liners :- ① This type of liners have direct contact with the cooling jacket ② It is press fit into the cylinder bore & is supported only at the top & bottom.

③ Since the outer surface does not make contact with the cylinder bore <sup>no</sup> need to machinized the outer surface



④ These liners have direct contact with water jacket

hence coated to aluminium to make it corrosion resistant & proper <sup>rubber</sup> packing ~~ring~~ are provided for tight seal.



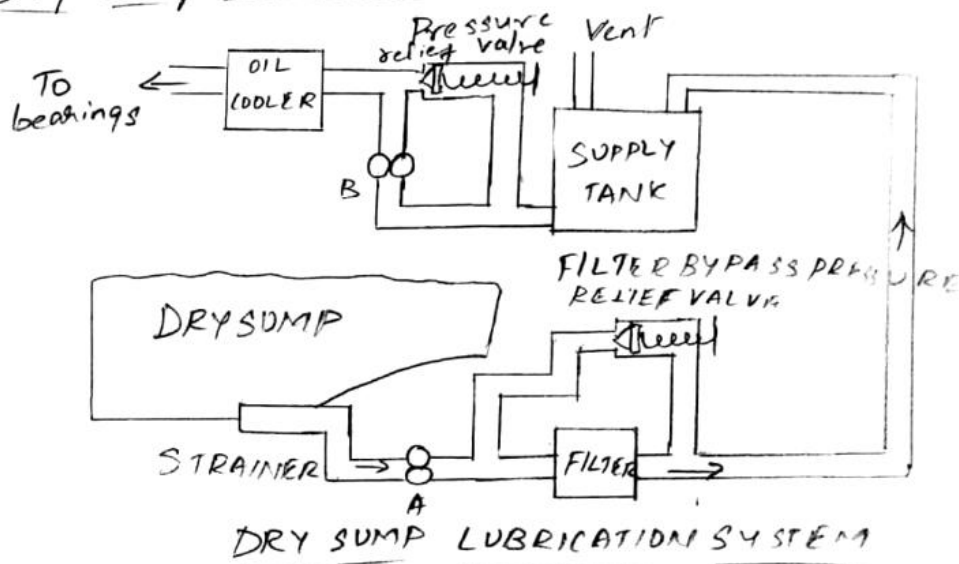
### SINGLE ROW OVERHEAD VALVE MECHANISM

In this type the cam operates the valve lifter which in turn actuates the push rod. The push rod further operates the rocker arm, which actuates the valve.

- This mechanism has following advantages
- ① Higher volumetric efficiency than the side valve design
  - ② Higher compression ratios can be used
  - ③ leaner air fuel mixtures can be burnt.

- It has few disadvantages as well
- ① Noisy operation
  - ② Larger valve lifter clearance are required
  - ③ Greater maintenance required due to more wear at more joints

## Dry sump lubricating system:-



In this system pumps are used. The pump 'A' is called scavenging pump & is located in the crank case portion. The oil from this pump is carried to an external tank. The pressure pump B pump the oil through filter to the cylinder & bearings. Oil dripping from cylinder & bearings in to the sump is again removed by Scavenging pump, which supplies oil to reservoir. The oil pump draws oil & delivers it under pressure to the engine bearings. It is suitable for Sport cars & jeeps.

### Objective of lubrication

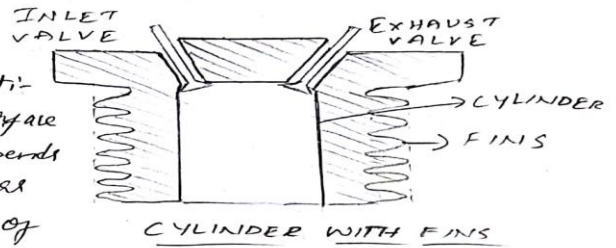
- 1) It reduces power loss by minimising friction between moving parts
- 2) Decreases wear & tear of the moving components.
- 3) It also acts like cooling agent by carrying the heat from hot moving parts
- 4) It give cushioning effect against shocks during combustion
- 5) It act as cleaning agent by absorbing all the impurities & oil may be further purified by filtration.
- 6) ~~seals~~ It acts as a sealing action by maintaining an effective seal on the piston rings & avoids entry of high pressure gases into the crank case.



## 1) Air cooling

Here the air stream flows continuously over the heated metal surface & the rate of heat dissipation depends on surface area of metal, air mass flow rate, thermal conductivity of metal, temperature difference between metal surface and air.

To increase the effectiveness, the metal surface area which is in contact with air should be increased. This is done by providing fins over cylinder barrels. The fins may be cast integral with the cylinder or may be attached separately.



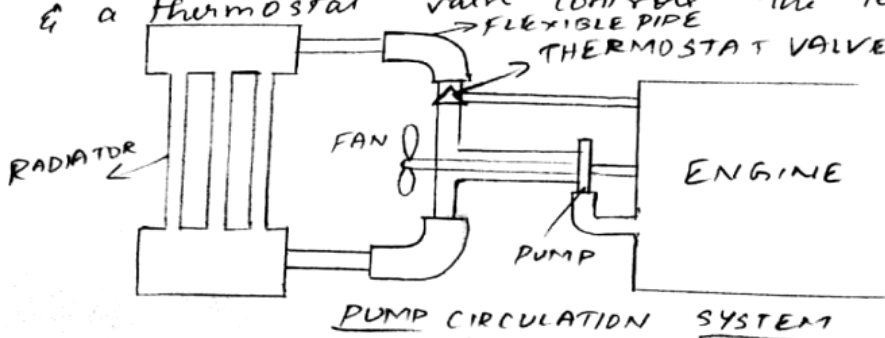
### Disadvantages

- 1) It is more noisy
- 2) Heat transfer coefficient for air is less
- 3) Distortion of cylinder may occur due to uneven cooling all around the cylinder.

### Advantages

- 1) Less no. of parts so less weight
- 2) Air cooled engines are useful in extreme climates.
- 3) Easy for maintenance
- 4) The engine warms up easily.

b) Pump circulation system:- This system is similar to thermosyphon system explained above. The only difference is cooling water circulation is effected by means of a pump & a thermostat valve controls the temperature of water.

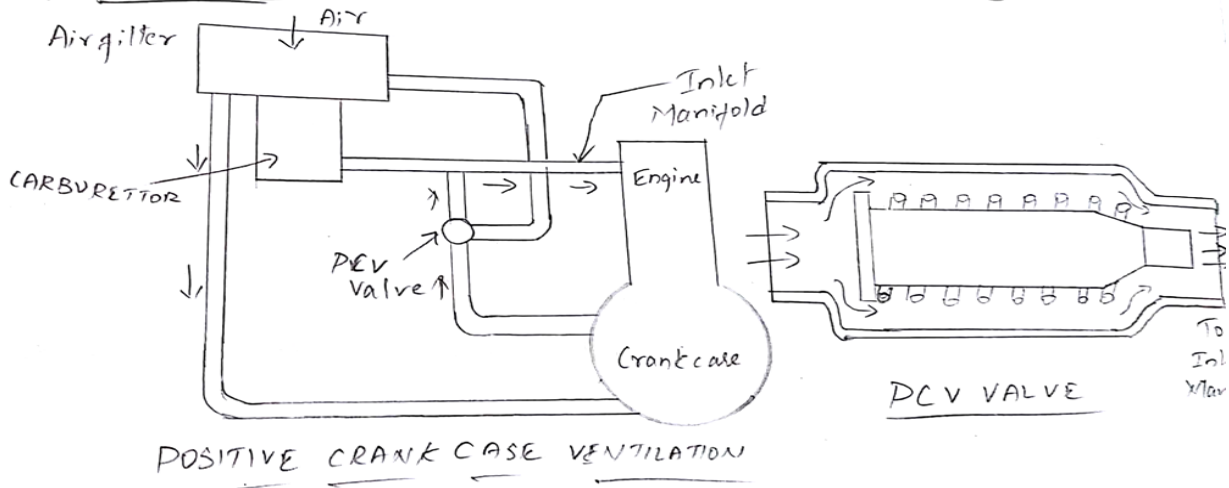


Advantages of this system over thermosyphon system are.

- 1) No need to place the radiator header tank above the engine level, as water circulation is effected by pump.
- 2) Radiator may be placed on the side or on the rear if necessary.
- 3) Cooling water circulation is proportional to both load & speed.
- 4) Because of efficient cooling water jacket size can be reduced. This results in overall decrease in engine size.

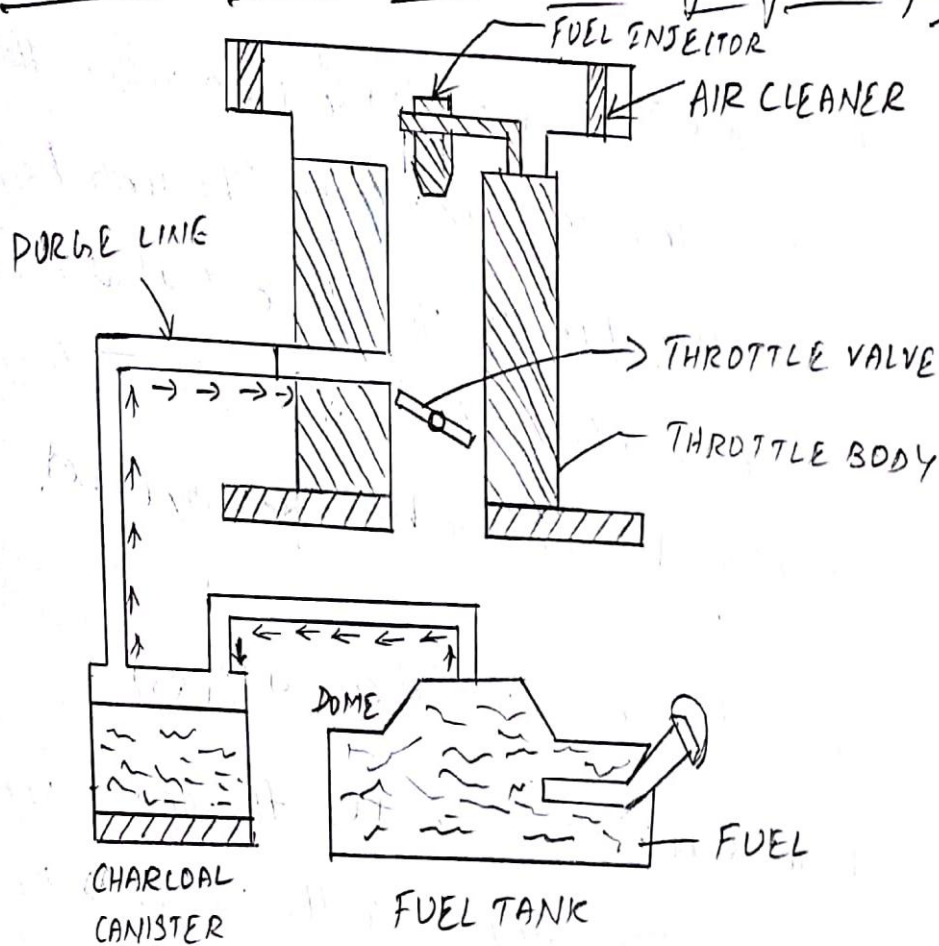
## Closed Crank case Ventilation

### 1) Positive Crank case Ventilation Systems [PCV Systems]



- 1) When the engine is running some unburned fuel & combustion products leak past the piston rings into the crankcase it is called blowby.
- 2) The blowby gases must be removed before it condensed with lubricating oil & forms into sludge.
- 3) Sludge corrodes the engine parts & clog the oil lines
- 4) To remove the blowby gas the filtered air from air filter is sent to crankcase which mixes with blowby gas
- 5) To avoid atmospheric pollution modern engines have PCV val.
- 6) PCV valve has spring loaded tapered valve
- 7) The PCV valve regulates the flow of blowby gases to the air manifold <sup>gases</sup> will go back to the Air filter.
- 8) During idle or deceleration amount of blowby gases will be less and small PCV valve opening is needed
- 9) Likewise depending on the speed of the engine the PCV valve operates.
- 10) So that the pollution due to the blowby gases is controlled.

## Evaporative Control System (ECS) for fuel injected engines



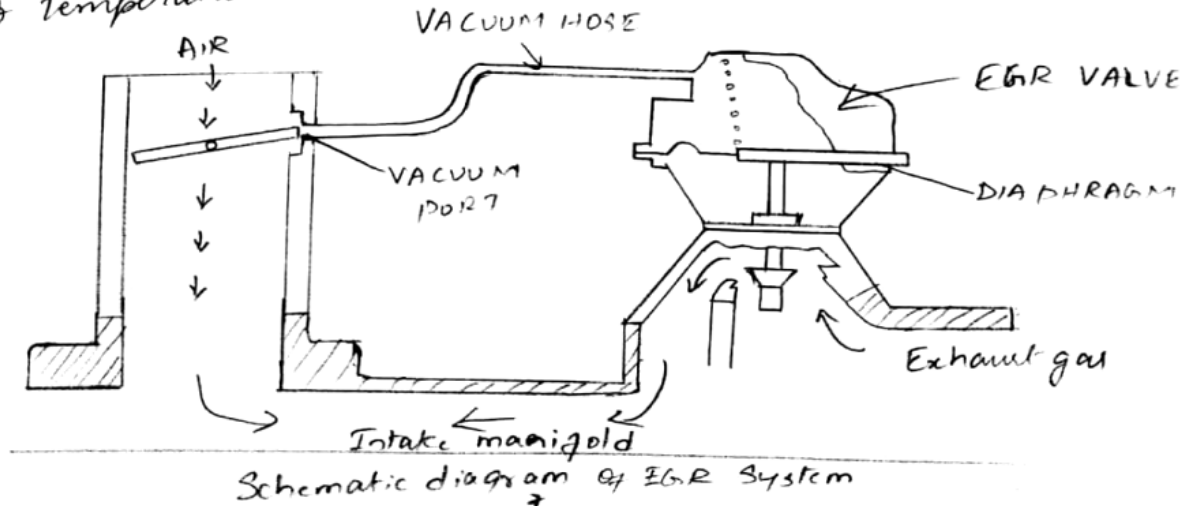
### ECS for an engine with throttle body injection

The fuel injection system do not have float bowl, therefore ECS controls escape of fuel vapours from the fuel tank only. The canister is connected to hose from the fuel tank. The purge line from the canister is connected to the throttle body. An electric purge control solenoid may be used instead of vacuum operated purge valve. The solenoid valve may be fitted on the canister or in the purge line & is normally open.



#### 4] Exhaust gas Recirculation (EGR)

The higher the combustion temperature is, more than <sup>1927°</sup> results in the formation of  $\text{NO}_x$ . So EGR system is used to send metered quantity (6 to 13%) of inert exhaust gas to ~~send~~ the combustion chamber to reduce the ~~to increase~~ temperature hence reduce  $\text{NO}_x$ .



The simplest form of EGR system is shown in the fig. It consists of a passage which connects exhaust manifold & intake manifold. It consists of a spring loaded diaphragm that forms the vacuum chamber at the top of the valve. A tube connects vacuum chamber & vacuum ~~chamber~~ <sup>port</sup> in the throttle body. In the absence of vacuum the diaphragm moves down due to spring action thus closes the passage. In this case no exhaust gas recirculates engine is idle & formation of  $\text{NO}_x$  is minimum. When the throttle opens it moves past the vacuum port this allows the intake manifold vacuum to act through the port & move the diaphragm up to open the valve. As the valve raises up some exhaust gases pass through the valve into intake manifold. The exhaust gases mix with air fuel mixture & then enters into engine cylinders. This reduces temperature & hence formation of  $\text{NO}_x$ .