BITT POLYTECHNIC
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SUBJECT : POWER ENGINEERING **SEMESTER : 5TH**

1-Marks Questions

1. **The operation of forcing additional air under pressure in the engine cylinder is known as:-**
   - a) Scavenging
   - b) Turbulence
   - c) Supercharging
   - d) Pre-ignition

Answer: Scavenging

2. **The mean effective pressure obtained from engine indicator indicates the**
   - a) Maximum pressure developed
   - b) Minimum pressure
   - c) Instantaneous pressure at any instant
   - d) Average pressure

Answer: Maximum pressure developed

3. **The loud pulsating noise heard within the cylinder of an internal combustion engine is known as**
   - a) Detonation
   - b) Turbulence
   - C) Pre-ignition
   - d) Supercharging

Answer: Detonation

4. Rotary compressor is best suited for

a) Large quantity of air at high pressure
b) Small quantity of air at high pressure
c) Small quantity of air at low pressure
d) Large quantity of air at low pressure

Answer: Large quantity of air at low pressure

5. Reciprocating air compressor is best suited for

a) Large quantity of air at high pressure
b) Small quantity of air at high pressure
c) Small quantity of air at low pressure
d) Large quantity of air at low pressure

Answer: Small quantity of air at high pressure

5-MARKS QUESTTION

6. What is heat engine?

Answer:

A heat engine is a machine, which converts heat energy into mechanical energy. The Combustion of fuel such as coal, petrol, and diesel generates heat. This heat is supplied to a working substance at high temperature. By the expansion of this substance in suitable machines, heat energy is converted into useful work.

7. What is the type of heat engine?

Answer:

There are two types of heat engine

(i) External combustion and

(ii) Internal combustion.

In a steam engine the combustion of fuel takes place outside the engine and the steam thus formed is used to run the engine. Thus, it is known as external combustion engine. In the case of internal combustion engine, the combustion of fuel takes place inside the engine cylinder itself.

8. What is the classification of IC engine?

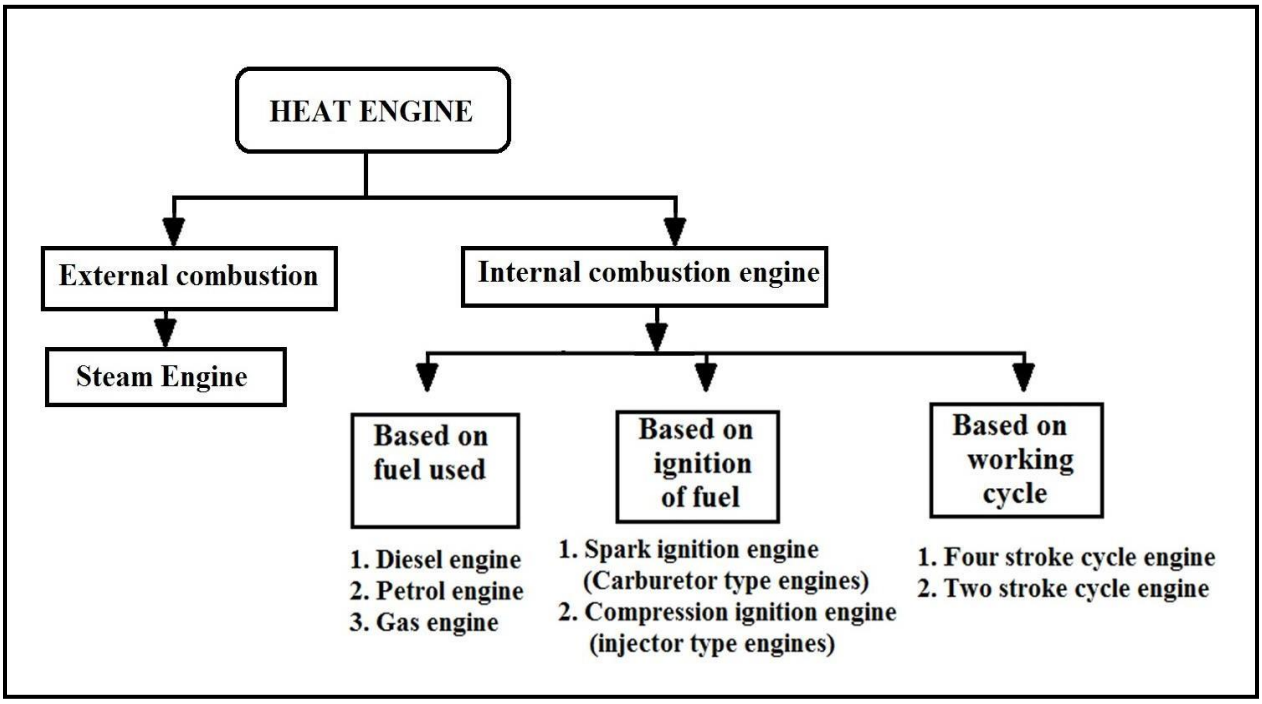
Answer:

The IC engine can be further classified as:

A) According to types of fuel : 1. Petrol engine 2. Diesel engine 3. Gasoline engine
B) According to working stroke: 1. two stroke engines 2. Four stroke engine
C) According to working cycle: 1. Otto cycle engine 2. Diesel cycle engine 3. Duel cycle engine
D) According to arrangement of cylinder: 1. Vertical engine 2. Horizontal engine 3. In line engine 4. Radial engine 5. V-type engine
E) According to method of igniting fuel: 1. Spark ignition engine 2. Compression ignition engine

9. Draw flow chart of heat engine classification.

Answer:



10. What is spark ignition engine and compression ignition engine?

Answer:

Spark Ignition (Carburetor Type) IC Engine

In this engine liquid fuel is atomized, vaporized and mixed with air in correct proportion before being taken to the engine cylinder through the intake manifolds. The ignition of the mixture is caused by an electric spark and is known as spark ignition.

Compression Ignition (Diesel Type) IC Engine

In this only the liquid fuel is injected in the cylinder under high pressure

11. Write various components of internal combustion engine.

Answer:

There are various components of internal combustion engine:

a) Cylinder
b) Piston
c) Piston ring
d) Connecting rod
e) Crankshaft
f) Cylinder head
g) Crank case
h) Cylinder block

i) Cylinder sleeve
j) Flywheel
k) Inlet and exhaust valve
l) Push rod
m) Rocker arm. etc

12. What is cylinder of a heat engine? Which type of metal is use for construction cylinder?

Answer:

The cylinder of an IC engine constitutes the basic and supporting portion of the engine power unit. Its major function is to provide space in which the piston can operate to draw in the fuel mixture or air (depending upon spark ignition or compression ignition), compress it, allow it to expand and thus generate power. The cylinder is usually made of high-grade cast iron. In some cases, to give greater strength and wear resistance with less weight, chromium, nickel and molybdenum are added to the cast iron.

13. What is piston and piston ring of a heat engine?

Answer:

Piston:

The piston of an engine is the first part to begin movement and to transmit power to the crankshaft as a result of the pressure and energy generated by the combustion of the fuel. The piston is closed at one end and open on the other end to permit direct attachment of the connecting rod and its free action. The materials used for pistons are grey cast iron, cast steel and aluminium alloy. However, the modern trend is to use only aluminium alloy pistons in the tractor engine.

Piston Rings:

These are made of cast iron on account of their ability to retain bearing qualities and elasticity indefinitely. The primary function of the piston rings is to retain compression and at the same time reduce the cylinder wall and piston wall contact area to a minimum, thus reducing friction losses and excessive wear. The other important functions of piston rings are the control of the lubricating oil, cylinder lubrication, and transmission of heat away from the piston and from the cylinder walls. Piston rings are classed as compression rings and oil rings depending on their function and location on the piston.

14. What is compression rings?

Answer:

Compression rings are usually plain one-piece rings and are always placed in the grooves nearest the piston head. Oil rings are grooved or slotted and are located either in the lowest groove above the piston pin or in a groove near the piston skirt. Their function is to control

the distribution of the lubricating oil to the cylinder and piston surface in order to prevent unnecessary or excessive oil consumption ion.

15. What is the use of connecting rod of heat engine?

Answer:

This is the connection between the piston and crankshaft. The end connecting the piston is known as small end and the other end is known as big end. The big end has two halves of a bearing bolted together. The connecting rod is made of drop forged steel and the section is of the I-beam type.

16. Explain working of crankshaft of heat engine.

Answer:

This is connected to the piston through the connecting rod and converts the linear motion of the piston into the rotational motion of the flywheel. The journals of the crankshaft are supported on main bearings, housed in the crankcase. Counter-weights and the flywheel bolted to the crankshaft help in the smooth running of the engine.

17. What is the use of engine bearing and valve?

Answer:

Engine Bearings:

The crankshaft and camshaft are supported on anti-friction bearings. These bearings must be capable of withstanding high speed, heavy load and high temperatures. Normally, cadmium, silver or copper lead is coated on a steel back to give the above characteristics. For single cylinder vertical/horizontal engines, the present trend is to use ball bearings in place of main bearings of the thin shell type.

Valves:

To allow the air to enter into the cylinder or the exhaust, gases to escape from the cylinder, valves are provided, known as inlet and exhaust valves respectively. The valves are mounted either on the cylinder head or on the cylinder block.

18. Explain working of camshaft of an internal combustion engine.

Answer:

The valves are operated by the action of the camshaft, which has separate cams for the inlet, and exhaust valves. The cam lifts the valve against the pressure of the spring and as soon as it changes position the spring closes the valve. The cam gets drive through either the gear or sprocket and chain system from the crankshaft. It rotates at half the speed of the camshaft.

19. What is the working of flywheel?

Answer:

This is usually made of cast iron and its primary function is to maintain uniform engine speed by carrying the crankshaft through the intervals when it is not receiving power from a piston. The size of the flywheel varies with the number of cylinders and the type and size of the engine. It also helps in balancing rotating masses.

15. What is use of crank case in an internal combustion engine?

Answer:

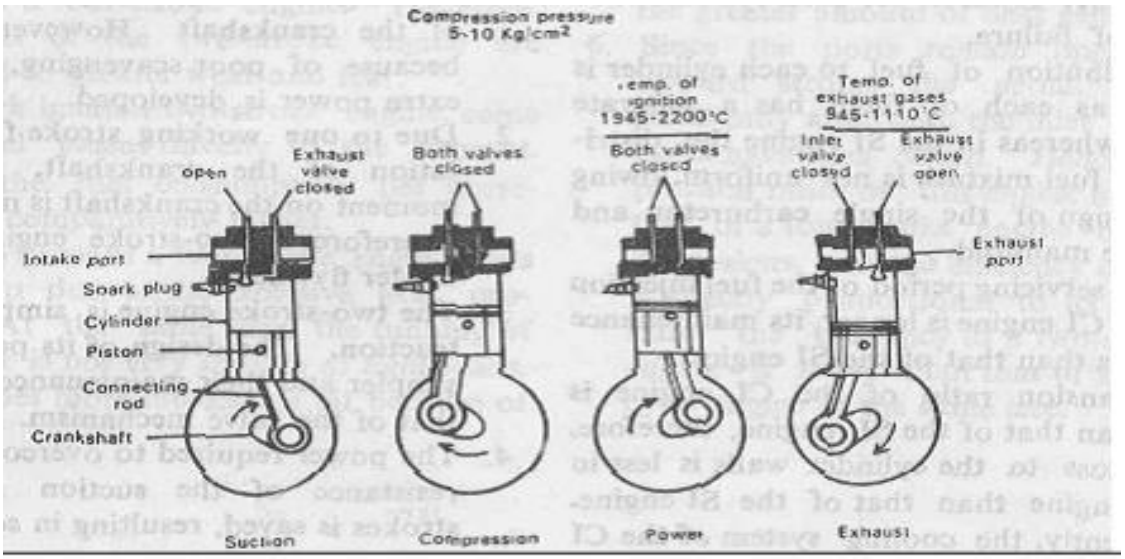
The crankcase is that part of the engine which supports and encloses the crankshaft and camshaft. It provides a reservoir for the lubricating oil. It also serves as a mounting unit for such accessories as the oil pump, oil filter, starting motor and ignition components. The upper portion of the crankcase is usually integral with cylinder block. The lower part of the crankcase is commonly called oil pan and is usually made of cast iron or castaluminum

10 MARKS QUESTION

1. **Explain principle and working of four-stroke spark ignition engine.**

Answer:

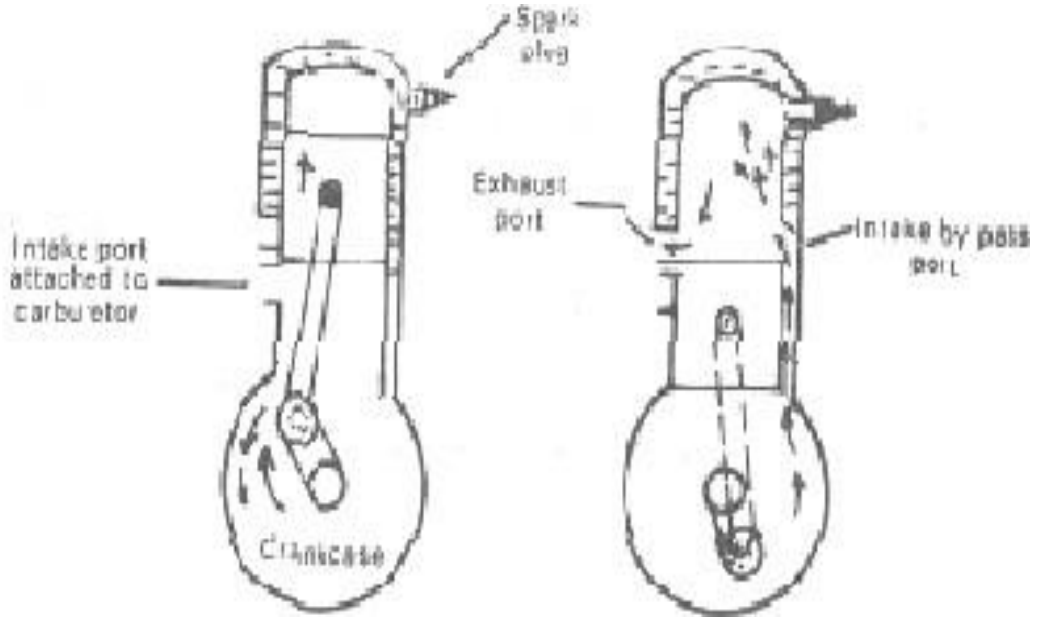
In this gasoline is mixed with air, broken up into a mist and partially vaporized in a carburetor. The mixture is then sucked into the cylinder. There it is compressed by the upward movement of the piston and is ignited by an electric spark. When the mixture is burned, the resulting heat causes the gases to expand. The expanding gases exert a pressure on the piston (power stroke). The exhaust gases escape in the next upward movement of the piston. The strokes are similar to those discussed under four-stroke diesel engines. The compression ratio varies from 4:1 to 8:1 and the air-fuel mixture from 10:1 to 20:1.



2. Explain principle and working of two-stroke cycle petrol engine.

Answer:

The two-cycle carburetor type engine makes use of an airtight crankcase for partially compressing the air-fuel mixture. As the piston travels down, the mixture previously drawn into the crankcase is partially compressed. As the piston nears the bottom of the stroke, it uncovers the exhaust and intake ports. The exhaust flows out, reducing the pressure in the cylinder. When the pressure in the combustion chamber is lower than the pressure in the crankcase through the port openings to the combustion chamber, the incoming mixture is deflected upward by a baffle on the piston. As the piston moves up, it compresses the mixture above and draws into the crankcase below a new air-fuel mixture.

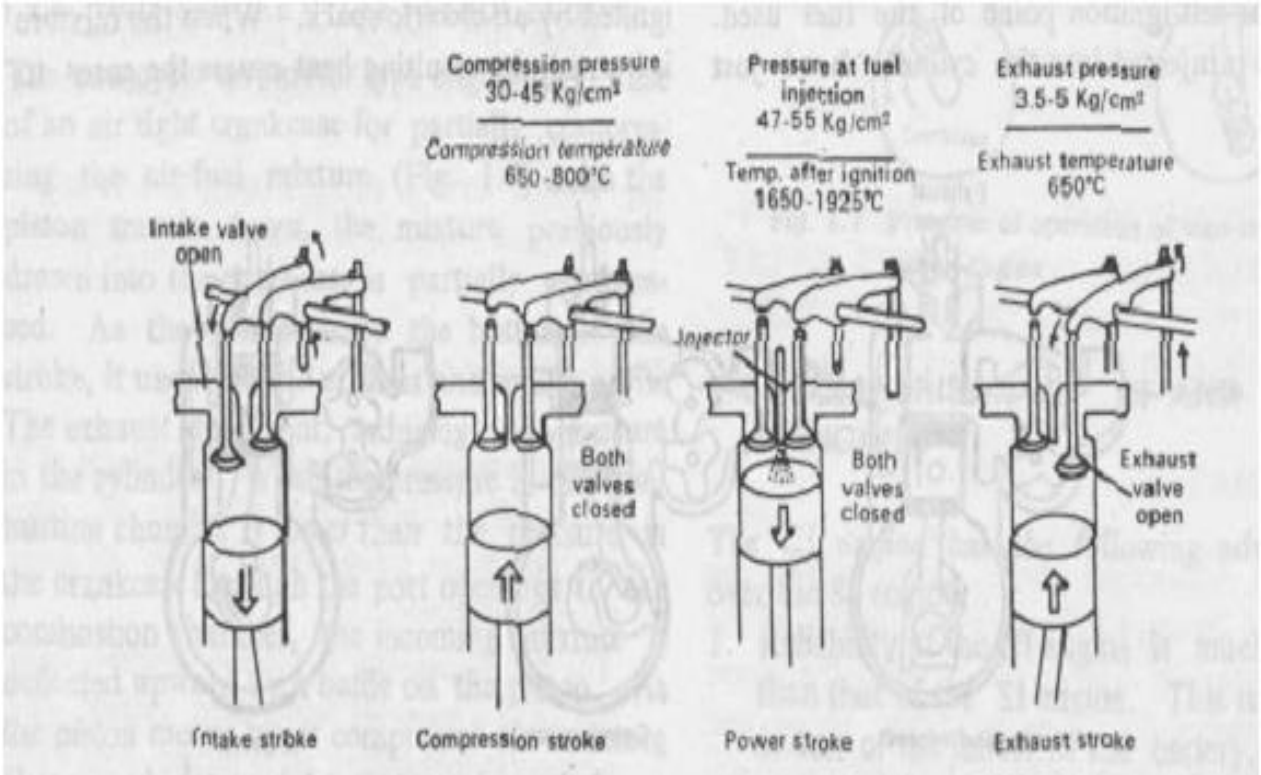


3. Explain principle and working of four-stroke cycle diesel engine.

Answer:

In four-stroke cycle engines there are four strokes completing two revolutions of the crankshaft. These are respectively, the suction, compression, power and exhaust strokes. In Fig. 3, the piston is shown descending on its suction stroke. Only pure air is drawn into the cylinder during this stroke through the inlet valve, whereas, the exhaust valve is closed. These valves can be operated by the cam, push rod and rocker arm. The next stroke is the compression stroke in which the piston moves up with both the valves remaining closed. The air, which has been drawn into the cylinder during the suction stroke, is progressively compressed as the piston ascends. The compression ratio usually varies from 14:1 to 22:1. The pressure at the end of the compression stroke ranges from 30 to 45 kg/cm2. As the air

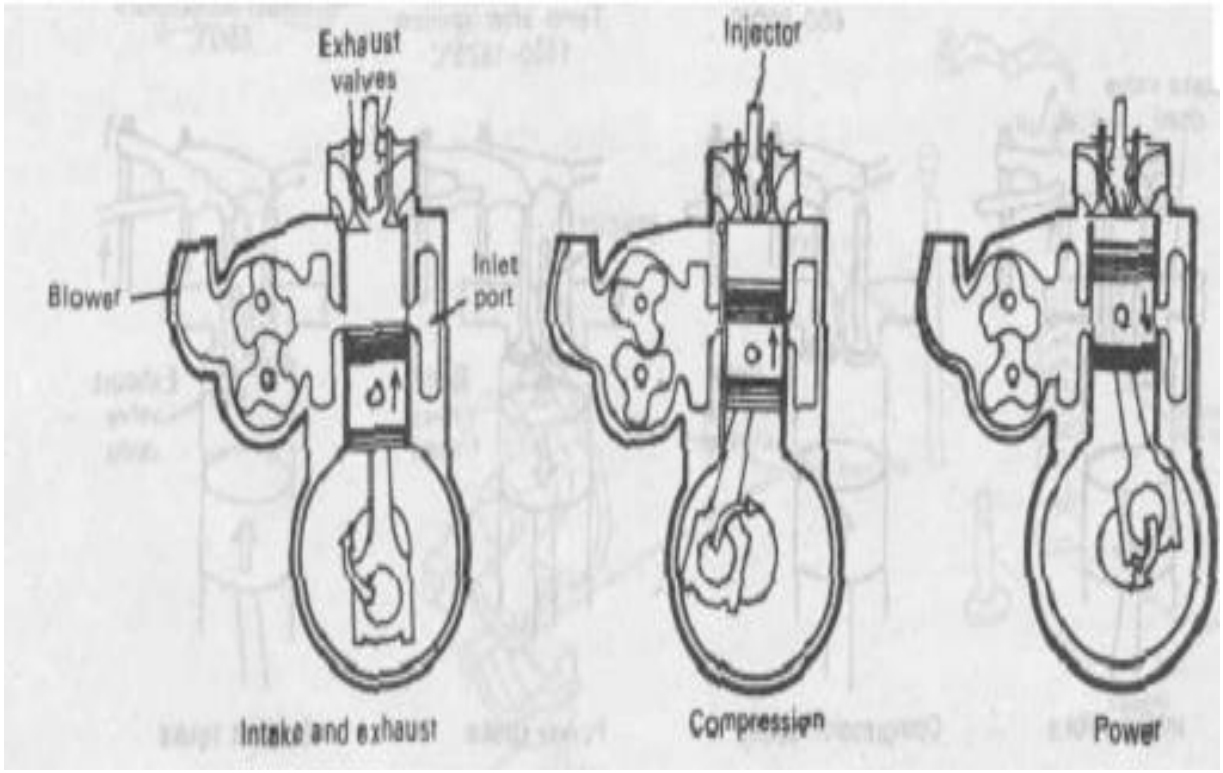
is progressively compressed in the cylinder, its temperature increases, until when near the end of the compression stroke, it becomes sufficiently high (650-800 oC) to instantly ignite any fuel that is injected into the cylinder. When the piston is near the top of its compression stroke, a liquid hydrocarbon fuel, such as diesel oil, is sprayed into the combustion chamber under high pressure (140-160 kg/cm2), higher than that existing in the cylinder itself. This fuel then ignites, being burnt with the oxygen of the highly compressed air. During the fuel injection period, the piston reaches the end of its compression stroke and commences to return on its third consecutive stroke, viz., power stroke. During this stroke the hot products of combustion consisting chiefly of carbon dioxide, together with the nitrogen left from the compressed air expand, thus forcing the piston downward. This is only the working stroke of the cylinder. During the power stroke the pressure falls from its maximum combustion value (47-55 kg/cm2), which is usually higher than the greater value of the compression pressure (45 kg/cm2), to about 3.5-5 kg/cm2 near the end of the stroke. The exhaust valve then opens, usually a little earlier than when the piston reaches its lowest point of travel. The exhaust gases are swept out on the following upward stroke of the piston. The exhaust valve remains open throughout the whole stroke and closes at the top of the stroke. The reciprocating motion of the piston is converted into the rotary motion of the crankshaft by means of a connecting rod and crankshaft. The crankshaft rotates in the main bearings, which are set in the crankcase. The flywheel is fitted on the crankshaft in order to smoothen out the uneven torque that is generated in the reciprocating engine.



4. Explain principle and working of two-stroke cycle diesel engine.

Answer:

The cycle of the four-stroke of the piston (the suction, compression, power and exhaust strokes) is completed only in two strokes in the case of a two-stroke engine. The air is drawn into the crankcase due to the suction created by the upward stroke of the piston. On the down stroke of the piston it is compressed in the crankcase, The compression pressure is usually very low, being just sufficient to enable the air to flow into the cylinder through the transfer port when the piston reaches near the bottom of its down stroke. The air thus flows into the cylinder, where the piston compresses it as it ascends, till the piston is nearly at the top of its stroke. The compression pressure is increased sufficiently high to raise the temperature of the air above the self-ignition point of the fuel used. The fuel is injected into the cylinder head just before the completion of the compression stroke and only for a short period. The burnt gases expand during the next downward stroke of the piston. These gases escape into the exhaust pipe to the atmosphere through the piston uncovering the exhaust port. Modern Two-Stroke Cycle Diesel Engine The crankcase method of air compression is unsatisfactory, as the exhaust gases do not escape the cylinder during port opening. Also there is a loss of air through the exhaust ports during the cylinder charging process. To overcome these disadvantages blowers are used to recompress the air. This pre-compressed air enters the cylinder through the port. An exhaust valve is also provided which opens mechanically just before the opening of the inlet ports.



5. What is the compression of CI engine and SI engine?

Answer:

1. Reliability of the CI engine is much higher than that of the SI engine. This is because in case of the failure of the battery, ignition or carburetor system, the SI engine cannot operate, whereas the CI engine, with a separate fuel injector for each cylinder, has less risk of failure.
2. The distribution of fuel to each cylinder is uniform as each of them has a separate injector, whereas in the SI engine the distribution of fuel mixture is not uniform, owing to the design of the single carburetor and the intake manifold.
3. Since the servicing period of the fuel injection system of CI engine is longer, its maintenance cost is less than that of the SI engine.
4. The expansion ratio of the CI engine is higher than that of the SI engine; therefore, the heat loss to the cylinder walls is less in the CI engine than that of the SI engine. Consequently, the cooling system of the CI engine can be of smaller dimensions.
5. The torque characteristics of the CI engine are more uniform which results in better top gear performance.
6. The CI engine can be switched over from part load to full load soon after starting from cold, whereas the SI engine requires warming up.
7. The fuel (diesel) for the CI engine is cheaper than the fuel (petrol) for SI engine.
8. The fire risk in the CI engine is minimized due to the absence of the ignition system.
9. On part load, the specific fuel consumption of the CI engine is low.