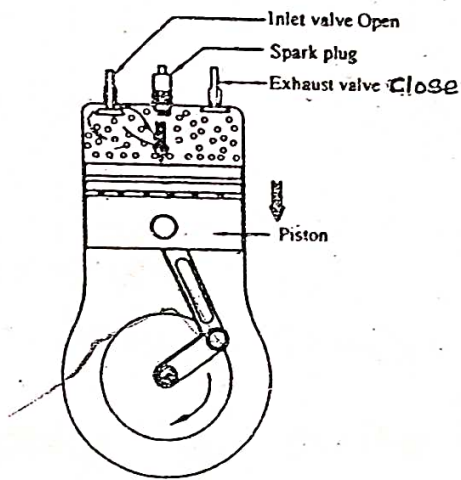


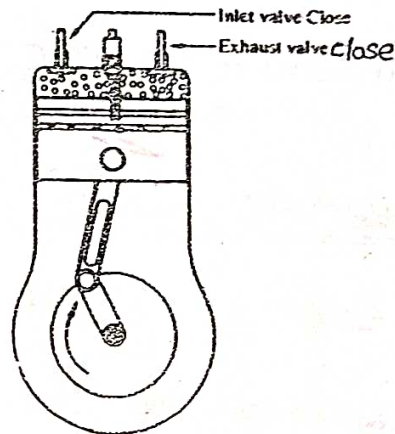
Four stroke petrol Engine :

In four stroke engine one power stroke is completed for every two revolutions of the crankshaft.

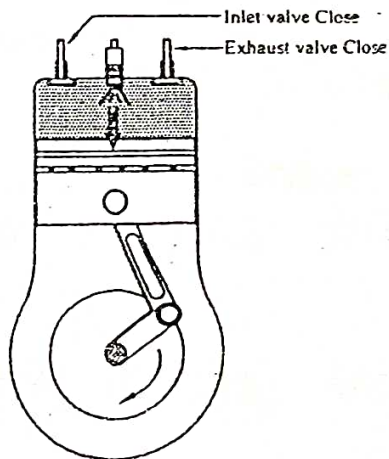
Working principle of four stroke petrol Engine :



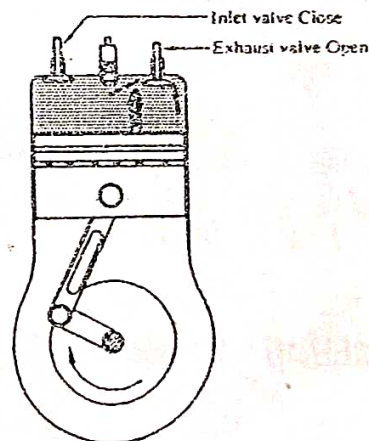
Suction



Compression



Power Stroke



Exhaust Stroke

I: Suction stroke :

1. In the suction stroke, piston moves from top dead center to bottom dead center.
2. The inlet valve opens and the air fuel mixture enters into the cylinder.

Valve position : Inlet valve open, Exhaust valve closed

piston movement : TDC to BDC.

II: Compression stroke :

1. In this compression stroke, petrol-air mixture is compressed by the movement of piston from bottom dead centre to top dead centre.
2. At the end of compression, the air fuel mixture is ignited by means of electric spark from the spark plug.

Valve position : Both inlet and exhaust valves are closed.

piston movement : BDC to TDC.

3. In this stroke pressure and temperature of the gases increase while the volume remains constant.

III: Working stroke (or) power stroke (or) Expansion stroke:

1. In this stroke high pressure gas products moves the piston from top dead centre to bottom dead centre.

2. The force exerted on the piston is transmitted to the crankshaft through the connecting rod.

Valve position : Both ^{inlet and exhaust} valves are closed.

piston movement : TDC to BDC .

IV: Exhaust stroke :

1. In this stroke, piston moves from bottom dead centre to top dead centre.

2. The exhaust gases are sent through the exhaust valve.

Valve position : Inlet valve close and exhaust valve open.

piston movement : BDC to TDC

After the piston reaches TDC, the exhaust valve closes. The inlet valve opens slightly before TDC. Then the cycle is repeated.

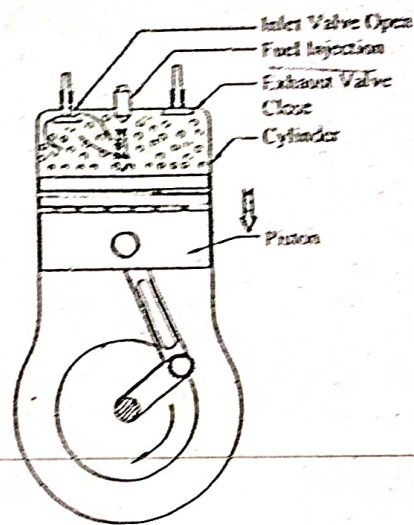
During this cycle, crankshaft makes two revolutions.

Diesel Engine [Compression Ignition Engine]

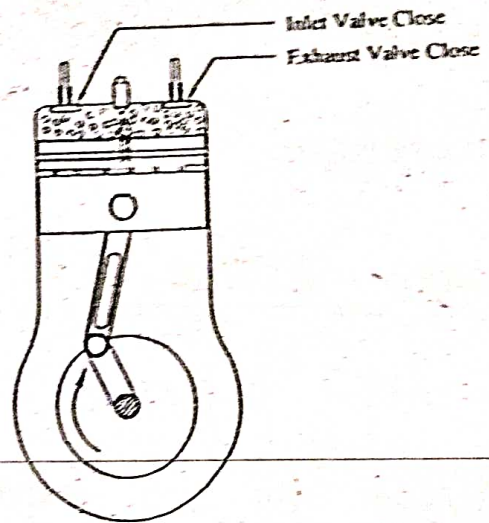
Four stroke Diesel Engine :

In four stroke engine one power stroke is completed for every two revolutions of the crank shaft.

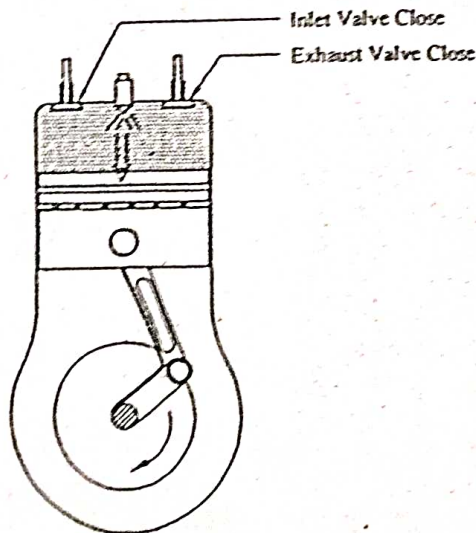
Working principle of four stroke diesel engine :



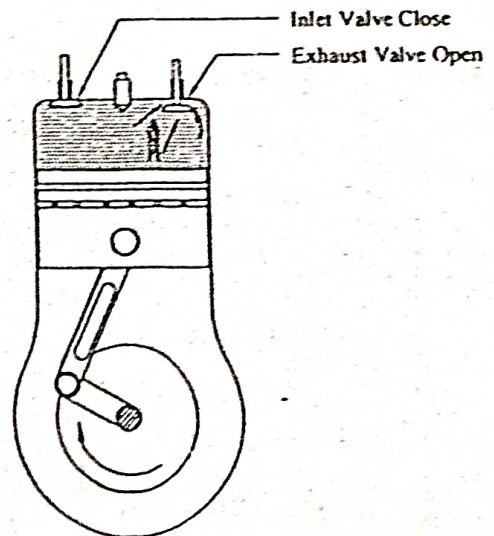
Suction



Compression



Power (or) Expansion Stroke



Exhaust Stroke

I. Suction stroke :

1. In the suction stroke, piston moves from top dead center to bottom dead center.

2. The inlet valve opens and the air fuel mixture enters into the cylinder.

Value position : Inlet valve open, exhaust valve closed.

Piston movement : TDC to BDC.

II. Compression stroke :

1. In this compression stroke, fuel-air mixture is compressed by the movement of piston from bottom dead centre to top dead centre.

2. At the end of compression, the air fuel mixture is ignited.

3. In this stroke pressure and temperature of the gases increased.

Value position : Both inlet and exhaust valves are closed.

Piston movement : BDC to TDC.

III: Expansion stroke (or) power stroke :

1. In this stroke high pressure gas product moves the piston from top dead centre to bottom dead centre.

2. The force exerted on the piston is transferred to the crankshaft through the connecting rod.

inlet and exhaust
Valve position: Both the valves are closed.

piston movement: TDC to BDC.

IV: Exhaust stroke :

1. In this stroke piston moves from bottom dead centre to top dead centre.

2. The exhaust gases are sent through the exhaust valve.

Valve position: Inlet valve closed and exhaust valve open.

piston movement: BDC to TDC.

After the piston reaches TDC, the exhaust valve closes. The inlet valve opens slightly before TDC. Then the cycle is repeated.

During this cycle, crankshaft makes two revolutions.

First stroke [upward movement of the piston]:

(A) compression, suction and Ignition :

1. The piston moves from BDC to TDC. The transfer port and exhaust port are closed.
2. At this time air inside the engine cylinder is compressed.
3. At the end of compression, pressure and temperature of air fuel mixture is increased.
4. When the piston almost reaches the TDC, the fuel is injected into the cylinder.
5. The fuel is mixed with the high temperature air in correct proportion and gets ignited.

During the first stroke the following processes are completed :

- (i) power is developed by the gas pressure.
- (ii) Exhaust gases are completely swept out from the engine cylinder.
- (iii) Fresh air in the crankcase is compressed by the underside of the piston.

Second stroke [Downward movement of piston]

(B) Expansion and Exhaust :

1. The burnt gases expand "inside the cylinder and the gases push the piston downwards.
2. The downward movement of the piston, the exhaust port is opened and the burnt gases are sent to the atmosphere through the exhaust port.
3. At the time, air in the crankcase gets compressed.
4. The compression of fresh air continues until the piston reaches TDC and the cycle is complete.

During the second stroke the following processes are completed :

- (i) partly scavenging takes place, the piston moves from BDC.
- (ii) Fresh air is sucked into the crankcase.
- (iii) Compression of air takes place due to upward movement of the piston.

During this cycle, the crankshaft makes one revolution.

Difference between two stroke and Four stroke engine :

Four stroke engine	Two stroke Engine.
1. One power stroke is obtained in two revolutions of crankshaft.	one power stroke is obtained each revolution of crankshaft.
2. Valves are provided.	Ports are provided.
3. Engine is cooled by water.	Engine is cooled by air.
4. More space required.	Less space required.
5. Heavy flywheel required.	Light flywheel required.
6. Thermal efficiency is more.	Thermal efficiency is less.
7. Volumetric efficiency is more.	Volumetric efficiency is less.
8. Lubrication is more.	Lubrication is less.
9. Less fuel consumption.	More fuel consumption.
10. Less wear and tear.	More wear and tear.
11. Torque is not uniform.	Torque is uniform.
12. Heavier engine.	Lighter engine.
13. More number of spare parts.	Less number of spare.
14. Initial cost is high.	Initial cost is low.
15. Low operating temperature.	More operating temperature.

Difference between petrol engine and diesel engine :

Petrol Engine	Diesel Engine
1. Operates on the principle of Otto cycle.	Operates on the principle of diesel cycle.
2. Fuel is ignited by spark plug.	Fuel is ignited by hot compressed air.
3. Less compression ratio.	More compression ratio.
4. Operates at high speed.	Operates at low speed.
5. Fuel used is petrol and more cost.	Fuel used is diesel and less cost.
6. Lighter in weight.	Heavier in weight.
7. Fuel is sent to <u>carburetor</u> .	Fuel is sent to fuel injector.
8. Fuel consumption is more.	Fuel consumption is less.
9. Less vibration.	More vibration.
10. Petrol is highly volatile.	Diesel is less volatile.
11. Initial cost is less.	Initial cost is more.
12. Thermal efficiency is low.	Thermal efficiency is more.

second stroke [Downward movement of piston]

(B) Expansion and exhaust :

1. The burnt gases expand inside the cylinder and the gases push the piston downwards.
2. The downward movement of the piston, the exhaust port is opened and the burnt gases are sent to the atmosphere through the exhaust port.
3. At the same time, the partially compressed air fuel mixture enters into the cylinder through the transfer port.
4. The escape of air fuel mixture along with exhaust gases is avoided and the charge entering the cylinder is deflected upwards.
The cycle is repeated again.

During the second stroke the following processes are completed :

- (i) Partly scavenging take place, the piston moves from BDC.
- (ii) Fresh charge is sucked in the crankcase.
- (iii) Compression of the charge takes place due to upward movement of the piston.

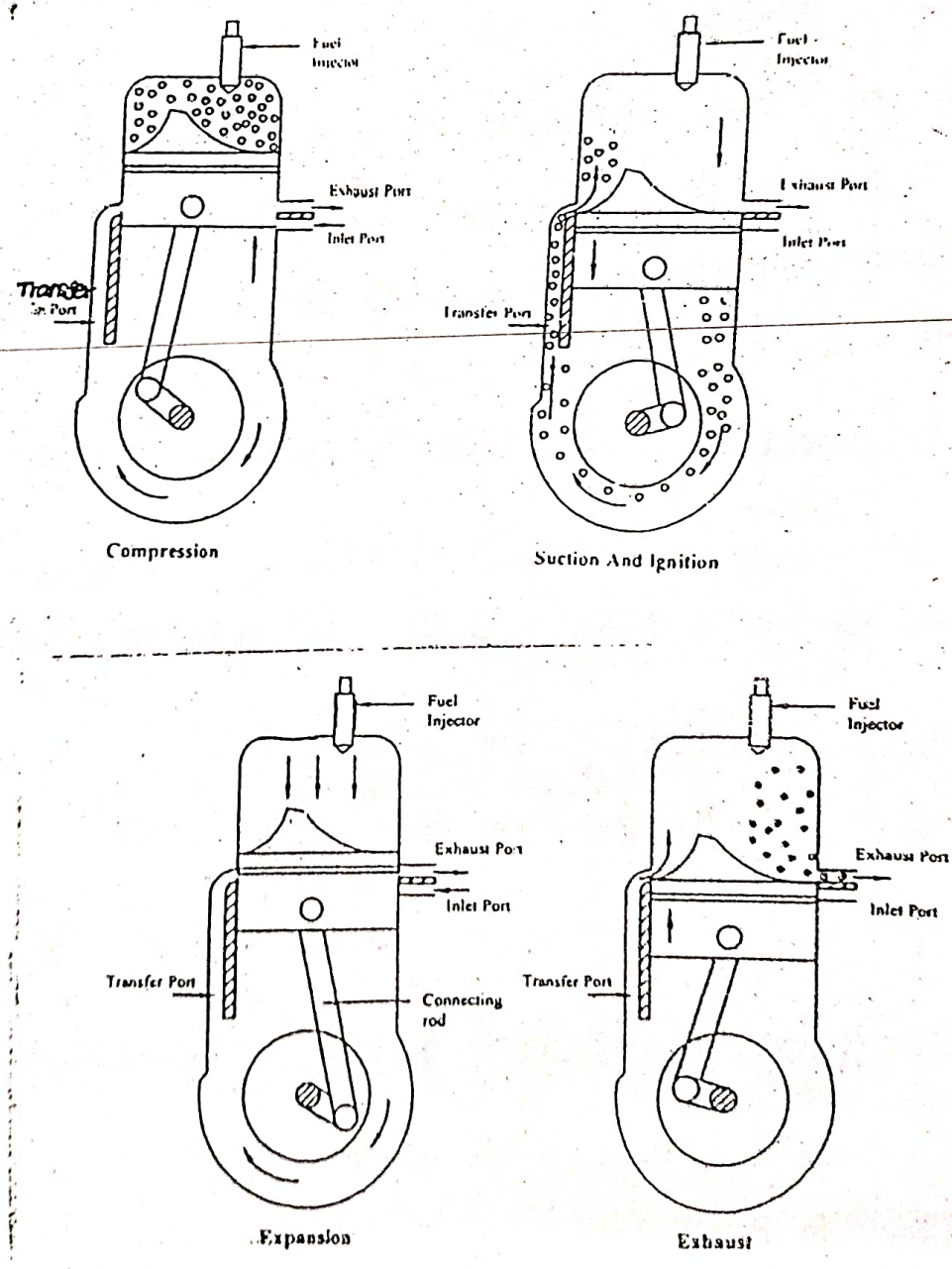
During this cycle, the crank shaft makes one revolution.

TWO STROKE ENGINES: [Diesel Engine].

In two stroke engine, one power stroke is completed for one revolution of the crankshaft.

Working principle of two stroke diesel engine:

A two stroke engine has no valves and only ports are present. There are three ports namely inlet port, exhaust port and transfer port.

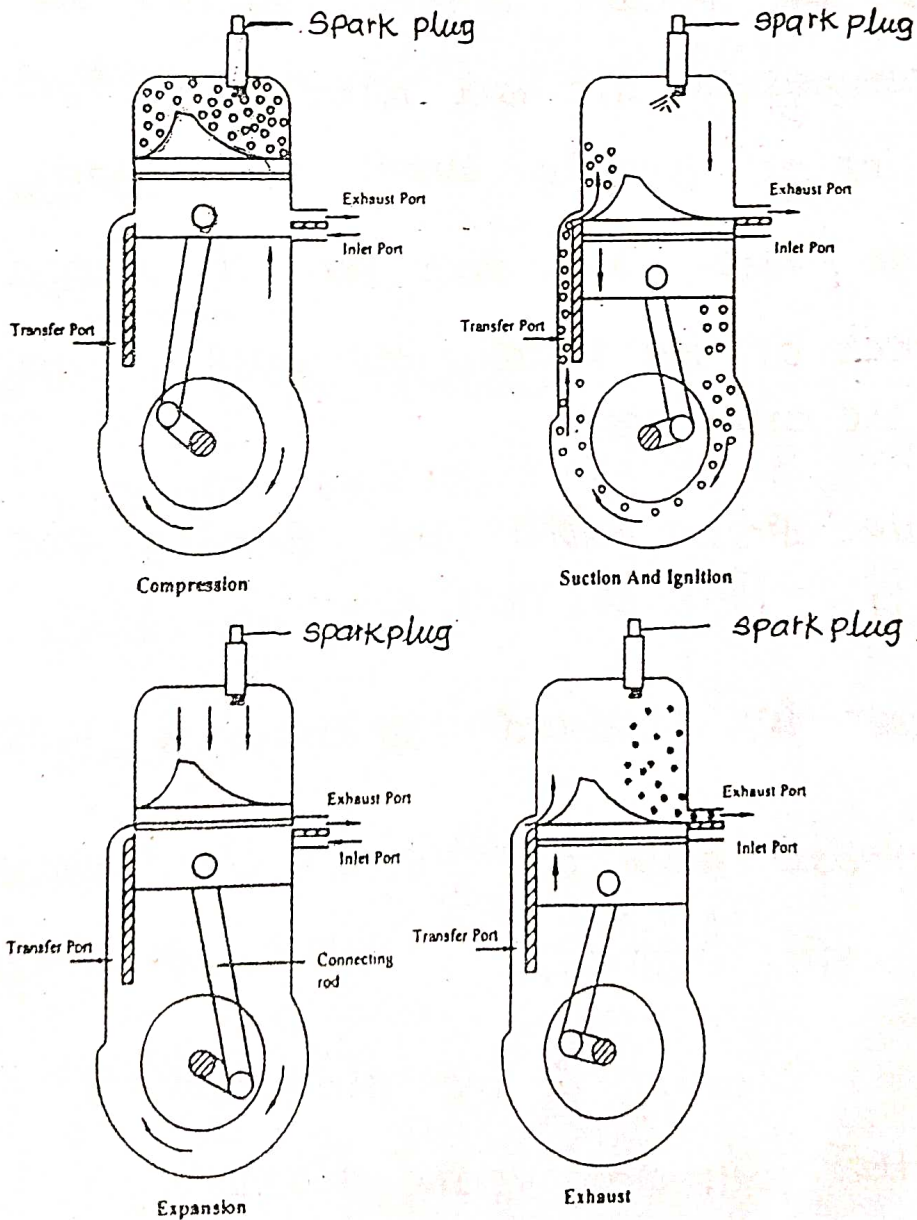


TWO STROKE ENGINES : [Petrol engine]

In two stroke engine, one power stroke is completed for one revolution of the crankshaft.

Working principle of two stroke petrol Engine :

A two stroke engine has no valves and only ports are present. There are three ports namely inlet port, exhaust port and transfer port.



First stroke [upward movement of piston]

(A) Compression, suction and Ignition :

1. The piston moves from BDC to TDC, the transfer port and the exhaust port are closed.
2. At this time air inside the engine cylinder is compressed.
3. At the end of compression, pressure and temperature of air fuel mixture is increased.
4. When the piston almost reaches the TDC, the compressed air fuel mixture is ignited by means of an electric spark from spark plug.
5. At the same time, inlet port is opened by the movement of the piston, the fresh charge enters into the crank case.

During the first stroke the following processes are completed :

- (i) Power is developed by the gas pressure.
- (ii) Exhaust gases are completely swept out from the engine cylinder.
- (iii) Fresh charge in the crankcase is compressed by the underside of the piston.

Carburettor :

Function of carburettor :

1. To mix the fuel with air in correct proportion and to evaporate the fuel with fast moving air.
2. To supply the air fuel mixture to the engine cylinder properly.
3. To regulate the supply of air fuel mixture entering into the engine cylinder.
4. To provide easy starting by means of a choke valve.

Cooling system :

Purpose of cooling system :

1. To maintain smooth running of engine.
2. To avoid the distortion of engine parts.
3. To avoid pre ignition of charge.
4. To maintain the temperature of engine within the limit.
5. To maintain the strength of the cylinder and piston.

Types of cooling system :

1. Air cooling (or) Direct cooling.
2. Water cooling.
 - (a) Thermo-siphon (or) Natural circulation system.
 - (b) Forced circulation system.

Lubrication system :

Purpose of lubrication system :

1. To reduce the friction between moving parts.
2. To minimize the vibration.
3. To reduce the wear and tear.
4. To reduce the corrosion and carbon deposits.
5. To reduce the heat of moving parts.
6. To reduce the noise created by the moving parts.