

## IC Engine

- 1 Explain with neat sketch Four stroke Diesel engine.

Diesel engine works on diesel cycle.

- The four stroke are
- 1) Suction stroke
  - 2) Compression stroke
  - 3) Expansion stroke
  - 4) Exhaust stroke

### 1 Suction stroke

During this stroke piston moves from Top dead center to Bottom Dead Center.

- In this stroke inlet valve remains open and exhaust valve remains close.

piston move downward motion that's why pressure decrease in cylinder and inlet valve open then air enter in cylinder.

When piston reaches Bottom Dead Center then inlet valve close.

## 2 Compression stroke

During this stroke inlet valve and exhaust valves remain closed.

Piston move form Bottam Dead Center and Top Dead center.

Piston move upward motian that's why air is compressed and pressure and temperatue of air is increase.

When piston reach Top dead center then diesel is inject by Fuel injector.

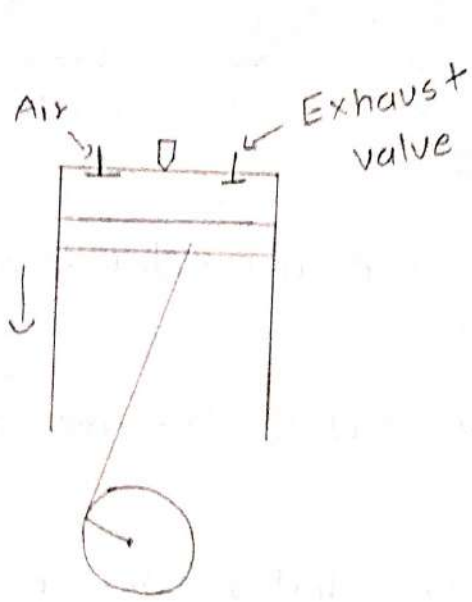
Compression ratio of diesel engine higher than ~~the~~ petrol engine.

## 3 Expansion stroke

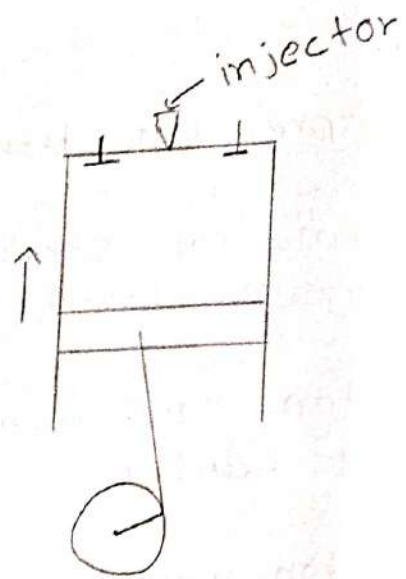
During this stroke inlet valve and exhaust valves remain close.

Piston move Form Top dead center to bottam dead center.

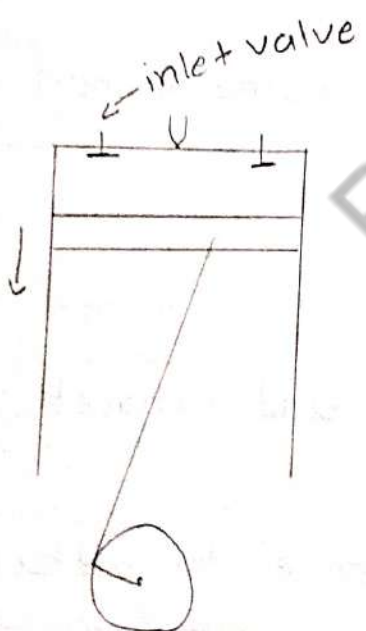
Due to combusiton of fuel, pressure and tempreat-ure of Combusiton gas are high.



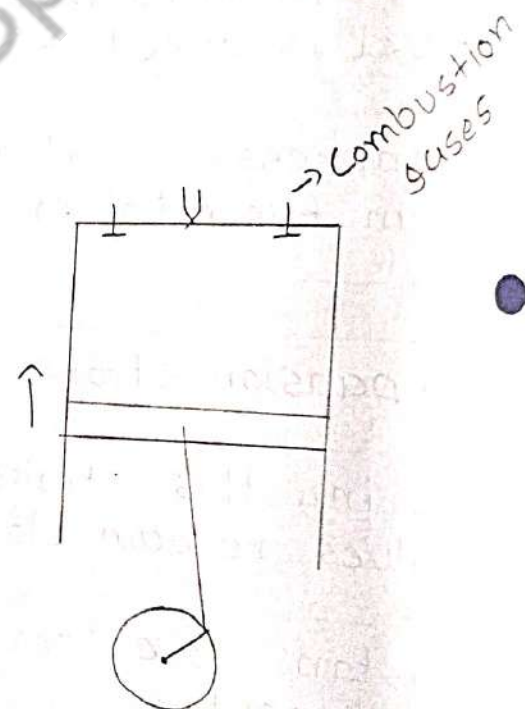
1) Suction stroke



2) Compression stroke



3) Expansion stroke



4) Exhaust stroke

Brain Spot

This high pressure, high temperature gases push piston to downward motion.

This stroke is working stroke because work is done by engine.

#### 4 Exhaust stroke

During this stroke inlet valve is closed and exhaust valve remain open.

Piston move from Bottom dead center to Top dead center.

Piston move upward motion and pushes the exhaust gases out of the cylinder.

Exhaust valve is closed and inlet valve is opened then cycle is repeated.

2 Explain with neat sketch two stroke Petrol engine.

In two stroke engine piston complete two stroke and crankshaft complete one revolution of the cycle.

1 First stroke:

During this stroke piston move from Bottom dead center to Top dead center.

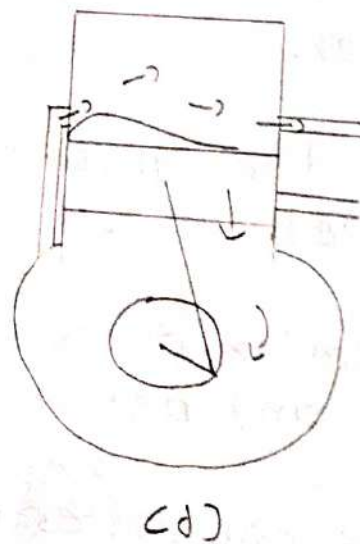
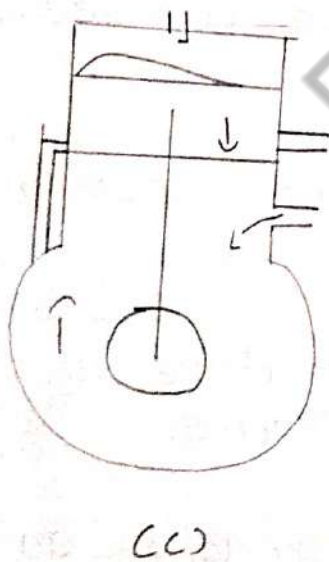
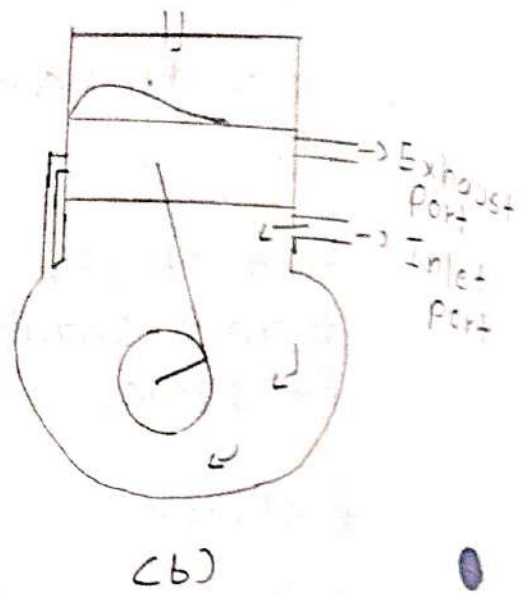
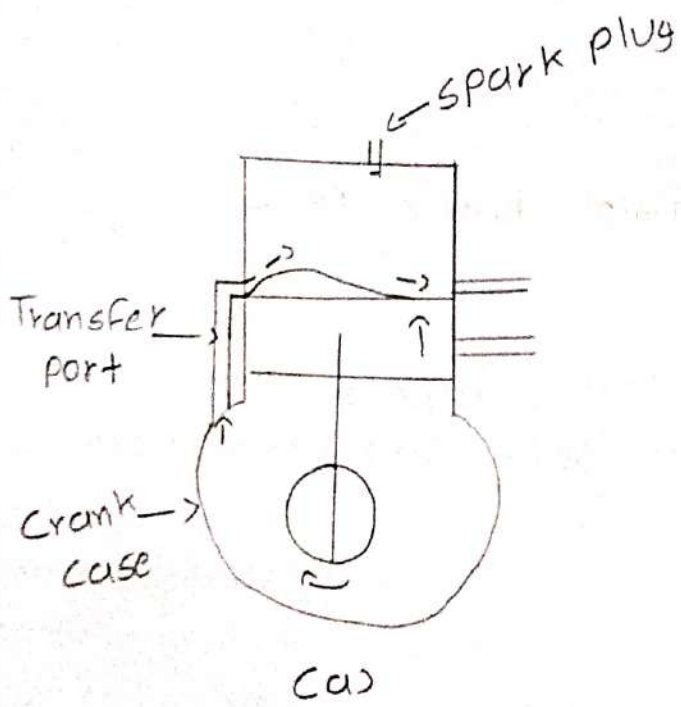
During the upward motion piston covers transfer port and exhaust port.

The air and petrol mixture is compressed in cylinder.

During the upward motion piston uncover the inlet port.

In cylinder pressure and temperature of air and petrol mixture increase.

Stroke completes when piston reaches on Top Dead center.



Brain Spot

## 2 Second stroke:

During this stroke piston moves from Top dead center to Bottom dead center.

The compressed mixture ignited by spark which provided by spark plug.

Due to combustion pressure and temperature is increase.

Due to high pressure and temperature combustion product push the piston on downward motion.

During downward motion piston cover the inlet port and uncover exhaust port.

The exhaust gas start escaping through the exhaust port. At same time Fresh charge compressed in crankcase through transfer port.

The charge strikes to the top of the cylinder and pushes out the exhaust gases.

When piston reaches BDC then cylinder is completely filled with fresh charge.

3 Define following terms.

- Indicated Power: The power developed by combustion of fuel in the cylinder of engine

$$IP = \frac{P_m A L n}{60}$$

Here, IP = Indicated Power

$P_m$  = mean effective Pressure

A = Cross section area of piston

L = Stroke length.

n = number of working stroke

Four stroke engine  $n = \frac{N}{2}$

two stroke engine  $n = N$

- Brake Power: The power available at the engine shaft. It is less than indicated power.

$$BP = \frac{2\pi NT}{60} = \frac{P_{mb} A L n}{60}$$

Here, N = speed of engine

T = resisting torque

$P_{mb}$  = brake mean effective Pressure



- Friction Power: It is power lost due to Friction

$$FP = IP - BP = \frac{P_m ALn}{60} - \frac{P_{mb} ALn}{60}$$

$$= \frac{ALn}{60} (P_m - P_{mb})$$

- Mechanical efficiency: It is ratio of Brake Power and Indicated power.

$$\eta_m = \frac{BP}{IP}$$

- Indicated Thermal efficiency: It is ratio of indicated power to heat supplied by fuel per second.

$$\eta_{ith} = \frac{IP}{\text{Fuel supplied}}$$

Here,  $\eta_{ith}$  = Indicated Thermal efficiency

- Brake Thermal efficiency: It is ratio of Brake power to heat supplied by fuel per second.

$$\eta_{bth} = \frac{BP}{\text{Fuel supplied}}$$

- Relative Efficiency: It is ratio to actual thermal efficiency to its air standard efficiency.

$$\eta_r = \frac{\text{Actual thermal Efficiency}}{\text{Air standard Efficiency}}$$

Here,  $\eta_r$  = Relative Efficiency

Brain Spot