IC Engine

1 Explain with neat sketch Four stoke Diesel engine.

Diesel engine works on diesel cycle.

- The four stoke are 1) Suction streke
  2) Compression stroke
  3) Expanssion stroke
  4) Exhaust stroke

1 Suction stroke

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

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

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

When piston reaches Bottam Dead Center then inlet valve close.

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2 Compression stroke

During this stroke intet 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 temperatve of air is increase.

When piston reach Top dead center then diesel is inject by fuel injecter.

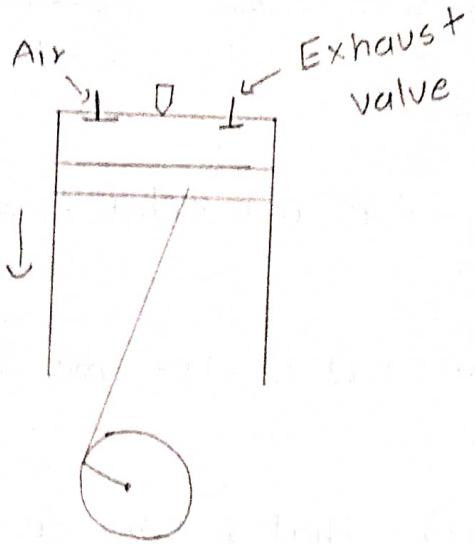
Compression ratio of diesel engine higher than ~~fue~~ petrol engine.

3 Expansion stroke

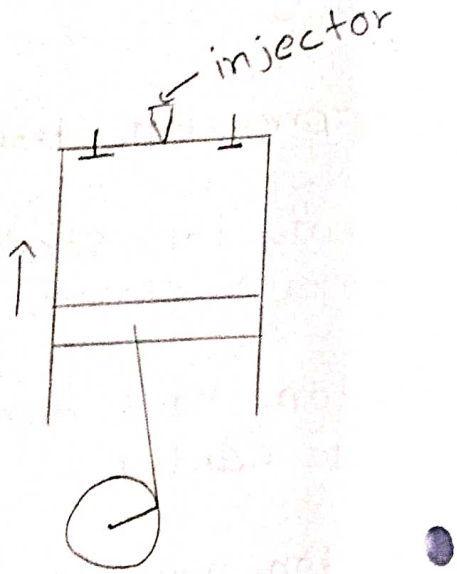
During this stroke inlet valve and exhaust valves remain close.

Piston move form Top dead center to bottam dead center.

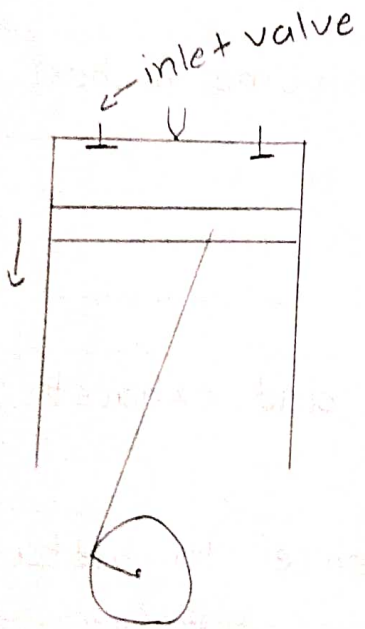
Due to combusiton of fuel, pressure and tempreature of Combusiton gas are high.



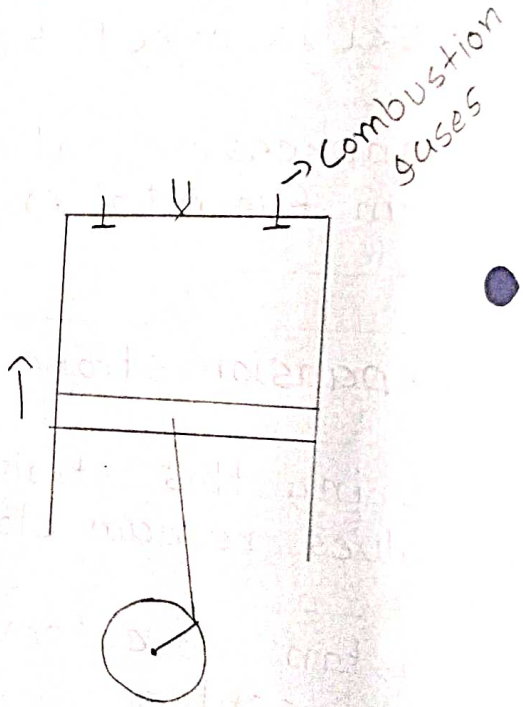
1) Suction stroke



2) Compression stroke



3) Expansion stroke



4) Exhaust stroke

This high pressure, high tempreature gases push piston to downword motian.

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

4 Exhaust stroke

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

Piston move from Bottam dead center to Top dead center.

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

Exhast valve is closed and intet valve is opened then cycle is repeated.

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2 Explain with neat sketch two stroke Petrol engine.

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

1 First stroke:

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

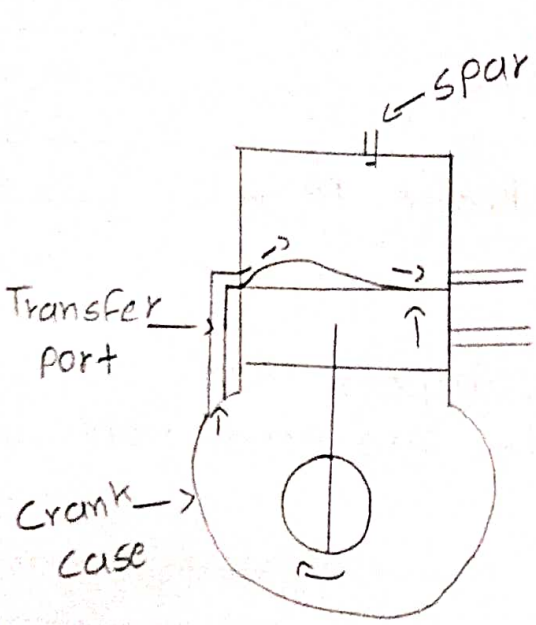
During the upward motion piston covers transfer port and exhaust port.

The air and petrol mixture is compressed in cylinder.

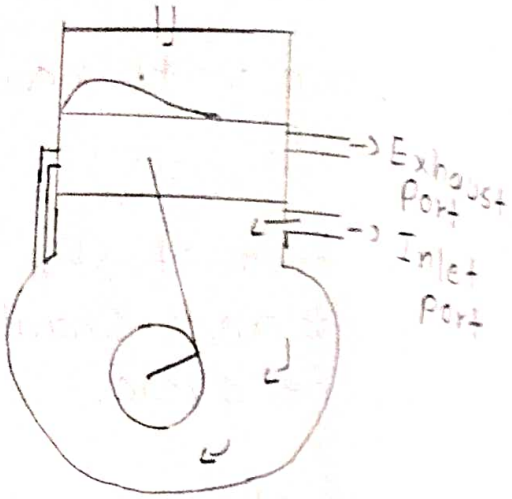
During the upward motion piston uncover the inlet port.

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

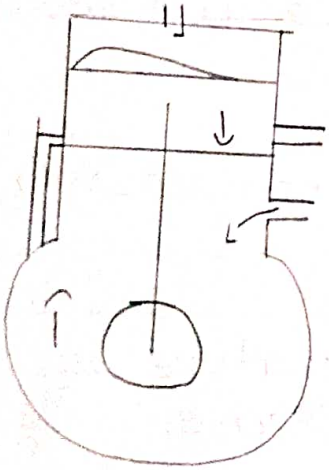
Strokes completes when piston reaches on Top Dead center.


spark plug
Transfer port
Crank case

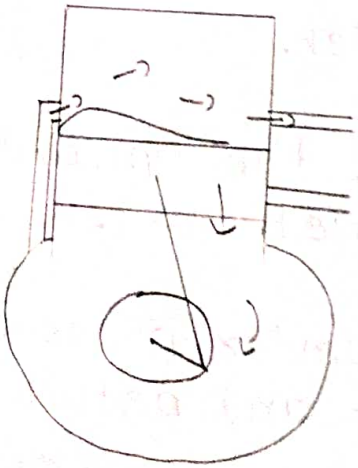
(a)


Exhaust Port
Inlet Port

(b)



(c)



(d)

2 Second stroke:

During this stroke piston moves from Top dead center to Bottam 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 exhast port.

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

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3 Define following terms.

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

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

Here, IP = Indicated Power
P_m = main effective Pressure
A = Cross section area of pistom
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} = breake mean effective Pressure

- Friction Power: It is power lost due to Friction

$$FP = IP - BP = \frac{P_m A L n}{60} - \frac{P_{mb} A L n}{60}$$

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

- Mechanical efficiency: It is ratio of Break 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, η_{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, η_r = Relative Efficiency