

## Assignment - 5

- 1) Make comparison between I.C and E.C engines.

I.C Engines	E.C Engines
(i) The combustion of fuel takes place inside the cylinder	(i) The combustion of fuel takes place outside the cylinder.
ii) Compact in size and more efficient	(ii) Large in size and less efficient.
iii) Low initial cost	(iii) More initial cost
iv) Working fluid is mixture of air and fuel	(iv) Working fluid is steam.
v) Easier and quick starting of these engines	(v) Starting is difficult and more time is required.
vi) Costly fuels are required like petrol.	(vi) Cheaper fuels may be used like coal.

- 2) Give classification of IC engine in details.

Ans They are classified as follows:-

- 1) Type of fuel used :-
  - 1) Petrol engine
  - 2) Diesel engine
  - 3) Gas engine
  - 4) Bi-fuel/ two fuel engine

- b) Nature of thermodynamic cycle:  
1) Otto cycle engine  
2) Diesel cycle engine  
3) Dual or mixed cycle engine
- c) Number of strokes per cycle  
1) Four stroke engine  
2) Two stroke engine
- d) Method of Ignition  
1) Spark Ignition engine  
2) Compression ignited engine.
- e) Method of cooling.  
1) Air cooled engine  
2) Water cooled engine
- f) Speed of engine  
1) Low speed  
2) Medium speed  
3) High speed
- g) Number of cylinders  
1) Single cylinder engine  
2) Multi cylinder engine
- h) Position of cylinders  
1) Inline engines    (2) V-engines    (3) Radial engines  
4) opposed cylinder engines    5) Opposed piston engine

3) Enlist different component of I.C engine and explain function of connecting rod, carburetor, fuel pump, fuel injectors and spark plug.

Ans-3 Components are:-

- 1) Cylinders
- 2) Cylinder head
- 3) Piston
- 4) piston rings
- 5) piston pin or Crankpin
- 6) Connecting rod
- 7) Crank and crank shaft
- 8) Valves
- 9) Flywheel
- 10) Crankcase
- 11) Carburetors
- 12) Fuel pump
- 13) Fuel injector
- 14) Spark plug.

⇒ Connecting rod

→ It is the member connecting piston through piston pin and crank shaft through crank pin. It converts the reciprocating motion of the piston into rotary motion of the crankshaft. It is made of steel by forging process.

⇒ Carburetor

- It is used in petrol engine for proper mixing of air and petrol.

⇒ Fuel pump:-

- It is used in diesel engine for increasing pressure and controlling the quantity of fuel supplied to the injector.

⇒ Fuel injector:

- It is used to inject diesel fuel in the form of fine atomized spray under pressure at the end of compression stroke.

⇒ Spark plug

- Spark plug is used in petrol engine to produce a high intensity spark for ignition of air-fuel mixture in cylinders.

4) Explain dead centres, clearance volume, stroke volume, stroke length with suitable neat sketch.

Ans Dead centres :

- In the vertical engines, top most position of the piston is called Top Dead centre and at the bottom most position, it is called bottom dead centre.

\* Clearance volume:

- It is the volume contained between the piston top and cylinder head when the piston is at the top or in dead centre.

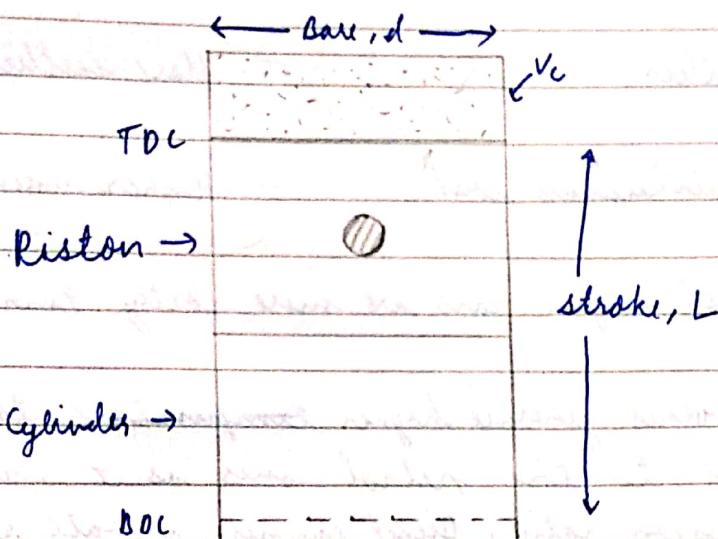
\* Stroke Volume

- It is the volume displaced by the piston in one stroke known as stroke volume or swept volume.

$$V_s = \frac{\pi}{4} d^2 l$$

\* Stroke length

→ It is the linear distance travelled by the piston when it moves from one end to the other end of cylinder.  
It is equal to twice the radius of crank.



b) Difference b/w petrol and diesel engine

Petrol engine

- It works on constant volume cycle

- It uses petrol

- Low compression ratio

→ air and petrol mixture is drawn during suction stroke

- The compressed charge is ignited by spark plug

Diesel engine

- It works on constant diesel cycle.

- It uses diesel

- High compression ratio

- Only air is drawn during suction stroke.

- Due to higher compressed temp of air ignites diesel.

- Quality governing method is used for controlling speed
- High engine speed
- Less costlier
- Low maintenance cost

- Quality governing method is used for controlling speed
- Low to medium speed
- More costlier
- Higher maintenance cost

Q) Why diesel engine cars are more costly than petrol cars?

Ans. Diesel engines generate higher torque figures compared to the petrol ones as it operates at high compression ratio. Diesel engines operate on compression ignition so the engine parts also need to have high mechanical strength which are expensive, so are more costlier than petrol cars.

11) Two stroke engines are lighter in weight and compact size compared to four stroke engine." Is this statement true? If it is then give reasons.

Ans. It is true because:-

- Valves aren't used hence weight of head, assembly is lighter, parts in cylinder wall make the cylinder壁 lighter.
- Four stroke engine requires heavier flywheel to maintain uniformly of power while two stroke engine has lighter flywheel.

12)  $N = 4$

$$d = 110 \text{ mm} = 0.11 \text{ m}, \quad A = \pi d^2 = \pi \left(\frac{d}{2}\right)^2$$

$$L = 1.3 \times 0.11 = 0.143 \text{ m}$$

$$\rho_m = 0.7 \text{ N/m}^2$$

Calorific value = 41100 KJ/kg

$$I.P = \frac{\rho_m \times L \times A \times N}{60 \times 2 \times 1000}$$

$$= \frac{0.7 \times 0.143 \times \pi \times 800 \times 143 \times 10^{-3}}{60 \times 2 \times 1000}$$

$$= 25.367522.92 \times 10^{-3} \text{ W}$$

$$= 25.36 \text{ KW}$$

13) Total swept volume =  $870 \text{ cc} = 8.7 \times 10^{-4} \text{ m}^3$

$$N = 300$$

$$T = 50 \text{ Nm}$$

$$\rho_m = 10 \text{ kPa}$$

$$B.P = \frac{2\pi NT}{60000}$$

$$= \frac{2\pi \times 300 \times 50}{60000}$$

$$= 1.57 \text{ KW}$$

$$A \times L = 8.7 \times 10^{-4} \text{ cm}^3 (\text{cubic metre})$$

$$I.P = \frac{P_m L A N}{60 \times 2 \times 1000}$$

$$= \frac{10 \times 8.7 \times 10^{-4} \times 300}{60 \times 2 \times 1000}$$

$$= 2.175 \text{ kW}$$

$$n_{\text{mech}} = \frac{B.P}{I.P}$$

$$= \frac{1.571}{2.175}$$

$$= 0.72229$$

$$= 72.23\%$$

14)  $B.P = 185 \text{ kW}$

$$N = 200 \text{ rpm}$$

$$P_m = 830 \text{ kPa}$$

$$\frac{L}{d} = 1.5, \quad L - \text{Stroke length}$$

$d - \text{bore}$

$$n_{\text{mech}} = 75\% = 0.75$$

$$\therefore n_{\text{mech}} = \frac{B.P}{I.P} = 0.75$$

$$\frac{185}{I.P} = 0.75$$

$$\therefore I.P = 246.66 \text{ kW}$$

18DCE070

classmate

Date \_\_\_\_\_

Page \_\_\_\_\_

$$I.P = \frac{P_m L A N}{2 \times 60 \times 1000}$$

$$= \frac{P_m \times 1.5 d \times \pi d^2 \times N}{2 \times 60 \times 1000 \times 4}$$

$$209246.66 = \frac{930 \times 1.5 d \times \pi d^2 \times 2100}{2 \times 60 \times 1000 \times 4}$$

$$\therefore d = 153 \text{ mm}$$