

NAME = HASNAT KHAN

ID = 16631

SUBJECT = THERMODYNAMICS

TEACHER = Sir. MUJTABA EHSAN

(12)

i) Ideal gas law:-

The ideal gas law is also called the general gas equation is the equation of state of a hypothetical ideal gas. It is a good approximation of the behaviour of many gases under many conditions, although it has several limitations.

Mathematically:-

$$PV = nRT$$

Where P , V & T are the pressure, volume & temperature; n is the amount of substance, & R is the ideal gas constant. It is the same for all gases. It can also be derived from the microscopic kinetic theory.

(v1) a)

ii)

• Dalton's law of partial pressure:-

It states that the total pressure of a mixture of gases is the sum of the partial pressures of its components.

⇒ The partial pressure of a gas in a mixture is the pressure that the gas would exert if alone.

Mathematically:-

$$\text{Total pressure} \leftarrow P_T = P_A + P_B + P_C$$

P_A = Partial pressure of gas A

P_B = Partial pressure of gas B

P_C = Partial pressure of gas C

(x1)

b) Explain the Carnot Cycle?

Carnot Cycle:-

The Carnot cycle is an ideal-gas cycle that consists of the two adiabatic processes ($Q = 0$) & the two isothermal processes ($\Delta E_{th} = 0$). These are the two types of processes allowed in a perfectly reversible gas engine.

Carnot Cycle operates:-

1) The gas is isothermally compressed at T_c . Heat energy Q_c = $|Q_{12}|$ is removed.

2) The gas is adiabatically compressed, with $Q = 0$, until the gas temperature reaches T_H .

3) After reaching maximum compression, the gas expands isothermally at temperature T_H . Heat $Q_H = Q_{34}$ is transferred into the gas.

4) The gas expands adiabatically, with $Q = 0$, until the temperature decreases back to T_c .

(Q3) Differentiate b/w water tube & fire tube boilers:

Ans)

The main difference between fire tube & water tube boilers is that in fire tube boilers the flue gases flow in the tubes & water flows from the shell & in water tube boilers, water flows from the tubes and the flue gases from the shell or passes over the tubes.

(Q2 b)

Ans) Vapour Absorption Refrigeration:-
Principle:-

Here the heat energy is utilized to achieve the refrigeration. An electric heater or steam is used to add the heat to the refrigerant for its evaporation. Also an absorber a pump & a generator are used to complete the cycle.

Working:-

Dry ammonia vapour from the evaporator enters the absorber containing water where it is absorbed by the water becomes a strong ammonia solution with an increase in temperature

The heat generated during this process is removed to some extent by circulating cold water through a pipe. Otherwise absorbing capacity reduces with hot water. The strong ammonia solution is now pumped by a pump to generator where it is heated by an electric coil. As a result ammonia vaporizes & separates out from the water. It is then driven out from the solution to the condenser where it is condensed & returns to the liquid state. The liquid ammonia is then collected in the receiver. The high pressure liquid ammonia is then passed through the throttle valve where it is expanded with decrease in temperature & pressure. Later it enters the evaporator kept in the storage room.

Q2)

Ans:-

When you are buying the refrigerator so there is the following factors that you will consider while buying ~~the~~ it.

- 1) Look for the energy stars.
- 2) Consider a refrigerator with a top-mounted freezer.
- 3) Purchase an appropriately sized refrigerator.
- 4) Consider the features that are most important.
- 5) Recycle your old refrigerator.
- 6) Take advantages of utility rebates.

(4)

Ans:)

Stroke:-

The word stroke ~~meanin~~ means that "the movement of the piston from the top dead centre (TDC) to bottom dead centre (BDC) or from BDC to TDC."

Four Stroke Engine:-

Four-stroke cycle engine works on four stroke principle i.e. there are four strokes in one cycle of such engine. Four stroke cycle engine is also called "four-cycle engine" or "Otto-cycle engine".

The four strokes of Otto-cycle engine are:

- 1) Intake stroke
- 2) Compression stroke
- 3) Power stroke
- 4) Exhaust stroke

1) Intake stroke:-

On the intake stroke, the piston is moving down due to which a partial vacuum is produced inside the cylinder. The intake valve is open, therefore, atmospheric pressure pushes the fresh air fuel mixture

in the cylinder through the intake valve.

2) Compression Stroke:-

When the piston reaches the BDC on the intake stroke, the intake valve closes. Then the piston moves up on the compression stroke. During this stroke, both the valves are closed, therefore no air-fuel mixture.

3) Exhaust Stroke:-

During the power stroke as the piston reaches BDC exhaust valve opens. Then the piston moves up on exhaust stroke. When the piston moves up, it pushes out the burnt gases from the cylinder through exhaust valve when the piston reaches TDC the exhaust valve closes & intake valve opens for the second cycle.

Q5 part a)

Ans)

Diesel Engine

Petrol Engine

1) These engines work on the diesel cycle

1) It work on the Otto cycle.

2) The fuel is mixed with air inside the cylinders.

2) Air & the fuel are mixed in a carburettor.

3) High compression ratio

3) Relatively low compression ratio.

4) High power production

4) Low power production.

5) Generally used in heavy vehicles such as trucks etc.

5) Used in light vehicles such as motorcycles & cars.