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ID # 16314

PAPER: Thermodynamic

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①

Question (1):

(a)

(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 behavior of many gases under many conditions, although it has several limitations.

The ideal gas law is often written in an empirical form.

MATHEMATICAL FORM:-  
$$PV = nRT$$

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



(ii) Dalton's Law of Partial Pressure:

Dalton's Law of Partial pressures states that in a mixture of non-reacting gases, the total pressure

(2)

Exerted is equal to the sum of the partial pressure of the individual gases. Dalton Law is ~~related~~ related to the ideal gas laws.

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

Mathematical form:-

$$P_T = P_A + P_B + P_C$$

(b) Explain the Carnot Cycle?

Carnot Cycle:-

The Carnot cycle is a theoretical ideal thermodynamics cycle proposed by French physicist. It provide an upper limit on the efficiency that any classical thermodynamics engine can achieve during the conversion of heat into work or conversely, the efficiency of a refrigeration system in creating a temperature difference by the explanation of work to the system. It is not an actual thermodynamic cycle but it is a theoretical construct.

(3)

As a 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 the 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  $T_c$ .

Que 3 Distinguish between water tubes and fire tube boiler's.

A

The boiler is divided into main two types. The main difference b/w fire tube and water tube is that in fire tube boiler the flue gases flow in the tubes and water tube flow

(4)

Flows from the shell and in  
water tube boiler, water flows  
from the tubes and the steam  
flue gasses from the shell  
or pass over the tubes.

Question 2 :-

(b) :- Explain Vapour absorption refrigeration  
Systems

Principles:-

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 and 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

(5)

is removed to some extent by circulating cold water through a pipe. Other wise absorbing capacity reduces with hot water. The strong ammonia solution is now pumped by out from the water, the pump to the generator where it is heated by an electric coil. As result ammonia is now pumped by out from the water. It is then driven out from the solution to the condenser where it is condensed and return 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 and pressure.



(6)

Quest<sup>(5)</sup>

Part a:-

Difference b/w a petrol engine & a diesel engine?

Ans

Diesel Engine :-

\* The Diesel engine is a internal combustion engine which is also know as the Compression-ignition engine.

\* In these engine the fuel is injected into a combustion chamber and then ignited by high temperature of the air in the chamber.

\* The high temperature of the air in the cylinder is due to the adiabatic compression. These engines only compress the air and not the fuel.

\* The engine work on a cycle Diesel cycle, which consists of a constant pressure process, a constant volume process, and two isentropic processes.

Q4

State the meaning of the word "Stroke" & describe the working of a 04 stroke again?

Ans

Stroke:-

A Stroke is movement of the piston from top ~~with~~ dead Centre (T.D.C) to the bottom dead Center (B.D.C) or from (BDC) to T.D.C.

Four Stroke Engine:-

Four Stroke cycle engine work on four stroke principle. There are four strokes in one cycle of such engine. Four stroke cycle engine is also called four cycle engine.

Four Stroke engine.

- (i) Intake
- (ii) Compression
- ~~(iii) Compression~~
- ~~(iv) Combustion~~
- (v) Power
- (vi) Exhaust.



(i) Intake :-

It is also known as induction or suction. This stroke of the piston begins at top dead center (T.D.C) and ends at bottom dead center (B.D.C). In this stroke the intake valve must be in the open position while the piston pulls in a fuel mixture into the cylinder by producing a vacuum through its downward motion. The piston is moving down as air is being sucked in by the downward motion against the piston.

(2) Compression :-

The stroke begins at B.D.C or just at the end of the suction stroke and ends at T.D.C. In this stroke the piston compresses the air fuel mixture in preparation for ignition during the power stroke (below). Both the intake and exhaust valves are closed during this stage.

Exhaust :-

Also known as outlet. During the exhaust stroke, the piston, once again, returns from B.D.C to T.D.C. While the exhaust valve is open. This action the spent air fuel mixture through the exhaust valve.

Power :-

The stroke in the cycle of an internal ~~stroke~~ combustion engine during which the piston is propelled by the pressure of the expanding steam or gases.

Ques 2

(A) :-

You need to buy a refrigerator for ~~any~~ your home. Outline the key factors that you will consider while buying the refrigerator?

Ans

- (1) Look for the energy star.
- (2) Consider a refrigerator with a Top Mounted Freezer.
- (3) Purchase an Appropriately size refrigerator.
- (4) Recycle your old Refrigerator.
- (5) Consider the features that are most important to you.
- (6) Take Advantage of Utility Rebates.