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Subject = Bem :

Basic electromechinal.

Q1:-

What is Diode:- ?
Between half wave rectification & full wave rectification.

1. Diode:

A diode is two-terminal electronic component that conduct current primarily in one direction, it has low low resistance in one direction, and high resistance in the other.

An electrical component that allow the flow of current in only one direction - In Circuit diagram a diode is represent by a triangle with Line across one vertex.

Half wave rectification-

=> Half wave rectifier ~~con~~ Circuit consist of a single diode and a step-down transformer, the high voltage AC will be converted into low voltage AC with the help of ~~a~~ step-down transformer-

=> During negative half of AC cycle, we will get zero DC voltage.

=> The voltage drop across the load resistor will appear only for the positive half of AC.

⇒ A diode connected in the circuit will be forward biased for positive half AC cycle and will be reversed biased during negative half.

Full wave Rectifier:

⇒ Full wave Rectifier consist of two diodes & one step down transformer which is centre tapped-

⇒ the P- terminal of diode is connected to the secondary winding of the transformer-

⇒ the N- terminal of both the diodes are connected to the centre tapping point of the secondary winding, & they also connected to load terminal-

⇒ The full wave circuitry does not possees DC saturation of transformer core because the current in the secondary winding flow in two halves of the secondary winding of the transformer & in opposite direction.

⇒ The full wave rectifier is electronic circuit which convert entire cycle of AC into pulsating DC.

Q1:=

B part:-

Solution:- $T = 785^{\circ}C$

$mass = 97.0\,g$.

$T = 15.0^{\circ}C$

$mass = 323\,g$.

- lose heat = Gain heat

$-[(c_{Au})(mass)(\Delta T)] = (c_{H_2O})(mass)(\Delta T)$

$-[(0.129\,J/g^{\circ})(97\,g)(T_f - 785^{\circ}C)] =$

$(4.184\,J/g^{\circ})(383\,g)(T_f - 15^{\circ}C)]$

$-[(12.5)(T_f - 785^{\circ}C)] = [1.35 \times 10^3](T_f - 15^{\circ}C)$

$-12.5T_f + 9.82 \times 10^3 = 1.35 \times 10^3 T_f - 2.02 \times 10^4$

$3 \times 10^4 = 1.36 \times 10^3 T_f$

$T_f = 22.1^{\circ}C$

Q No 2:-

@parts:

Isobaric process, Isometric process, Isothermal process and adiabatic process.

Isobaric process:

An Isobaric process in Thermodynamic process in the pressure stays constant, $\Delta P = 0$. the heat transferred to the system does work, but also change the internal energy of the system.

Adiabatic Process:-

An adiabatic process occur without transferring heat or mass between a thermodynamic system and it surroundings. Unlike isothermal process, and adiabitic process transfer energy to the surrounding only work.

Isometric process: A (constant volume (isochoric) Thermodynamic process in which the system is confined by mechanically rigid boundries.

⇒

Isothermal process :

Isothermal process on the basis of law of Thermodynamic where the temperature ~~remains~~ remains constent.

ONO2.

Part B :-

Solution:

$$e = 1 - \frac{T_C}{T_H}$$

$$e = 1 - \frac{300K}{500K}$$

$$e = \boxed{40\%}$$

Actual $e = 0.5e_1 = 20\%$

$$e = w/Q_H$$

$$w = eQ_H = 0.20(600J)$$

$$w = \boxed{120j}$$

①

Q NO3 :-

Q) Parts :- Internal Combustion engine :

⇒

The Internal Combustion engine is working Pressure and Temperature high.

⇒ The Internal Combustion engine have efficiency is 35 - 60 % -

⇒ it is ~~har~~ heavy engine whereas is Internal Combustion engin parts of Light and Compact.

⇒ In Internal Combustion engine, the working fluid cosist of combustible fluid placed inside a cylinder Then engines, the fluid undersoes combustion inside the cylinder and expand.

⇒ The Internal Combustion engine Noise produce from continues explation inside the cylinder of IC engine-

External Combustion engine:

⇒ External Combustion engine are the most common form of external heat engine, beause thy used in power plant.

⇒ External Combustion engine are no longer used in transportation, as mobile design are not efficient enough, but Thy continuse to be used in power plant.

⇒ In external combustion engine, the Combustion take place outside the Cylinder. Heat Then need to be transferred to the Cylinder where work is done.

⇒ External Combustion engine run smoothly and silently. ~~where~~

= External Combustion engin have 15 - 20 % effeciency.

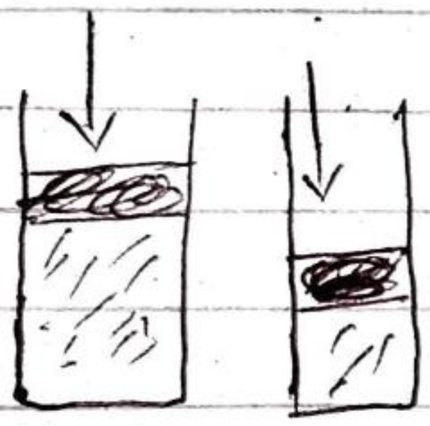
⇒ An external comb engin require a boiler and other component to transfer engy.

CONO3:-

B) Parts A diatomic gas of 300 K and 1 atm is compressed adiabatically decreased its volume by 1/12 ($V_A = 12V_B$) what is new pressure and Temp

$\gamma = 1.4$

Solution: A diabatic = Find P_B.



$$P_B = P_A \left(\frac{V_A}{V_B}\right)^{\gamma}$$

$\Delta Q = 0$

$$P_B = P_A = \left[\frac{12V_B}{V_B}\right]^{1.4}$$

$$P_B = (1\,atm)(12)^{1.4}$$

$P_B = 32.4$ atm or 3284 kPa

$\Delta Q = 0$

$$\frac{P_A V_A}{T_A} = \frac{P_B V_B}{T_B}$$

$$\frac{(1\,atm)(12V_B)}{(300K)} = \frac{(32.4\,atm)(1V_B)}{T_B}$$

$$T_B = 810\,K$$

QNO4:- Conduction & Convection

Conduction:

=> Energy transferred by direct conduct-
= Energy flow directly form warmer to cooler objects-
=> Continues until object temperature are equal-
=> When you heat a metal strip at one end, the heat travel to the other end-
=> As the metal is heated, the partical vibrate- These vibration pass Thermal energy along the metal causing it to heat up-
=> Heat flow rate Increase with area & temperature drop-

Convection:

The mode of energy transfer between a solid surface and the adjacent Liquid or gas That is in motion, & it involves the combined effect of conduction & fluid motion-

=> the faster the fluid motion, the greater the convection heat transfer.

=> Occur in gases are Liquids-
=> Movement of large number of particals in same direction-
=> Cycle occure while tempearcd difference exist.

(2)

Q4

Brass=

Solution=

$$Q_{water} = -Q_{Pb}$$

$$m_{water}\, C_{water}\, \Delta T_{water} = -(m_{Pb}\, C_{Pb}\, \Delta T_{Pb})$$

$$125\,(4.18)(T_f - 23) = -75(0.13)(T_f - 435)$$

$$522.5\,T_f - 12017.5 = -9.75\,T_f + 4241.25$$

$$+9.75\,T_f + 12017.5 \qquad +9.75\,T_f + 12017.5$$

$$532.25\,T_f \qquad\qquad 16258.75$$

$$\boxed{T_f = 30.5\,C}$$

(1) CONOS -

Solution:- The Inner and outer surface of the flat concrete roof of an electricity heated home are maintained at specified temp during a night. The heat loss through the roof and cost that night are to be determined.

Assumption:- (1) steady operating condition exist during the entir night surface temp of roof remains constant at specified value.

(2) Constant properties can be used roof.

Analysis:-

$$Q = KA \frac{T_1 - T_2}{L} = (0.8 w/m.^\circ C)(48 m^2)$$

$$\left(\frac{(15 - 4)^\circ C}{0.25 m}\right) = 1690 w$$

$$= 1.69 kw$$

(b) The amount of heat loss through the roof during a 10-hour period and its cost is

$$Q = QAT = (1.69 kw)(10 h) = 16.9 kwh$$

Cost = (Amount of energy)(Unit cost of energy)

$$= (16.9 Kwh)(\$0.08)(Kwh) = \$1.35$$

Discussion:- The cost of home owner of the heat loss through the roof that night was $1.35 the total heating bill of the house will be much larger since the heat losses through the walls are not considered in these calculation.