Final term Paper Summer-20

Name — Rizwan ullah khan

ID — 7807

Subject — Basic electromechical

Date — 26/9/2020

Submitted To — Engr. Ashraf Ali.

Name :- Rizwan ullah khan ID : 7807

Q1/ Part A

Diode :-

Diode is an electronic component that allow the flow of curren in only one direction. In Circut digrams, a diode is represented by a triangle with a line across one vertex. The most common type of diode uses a p-n junction.

⇒ diod has two terminals.

⇒ It limit the current to one direction.

⇒ Diode have an anode and a cathode.

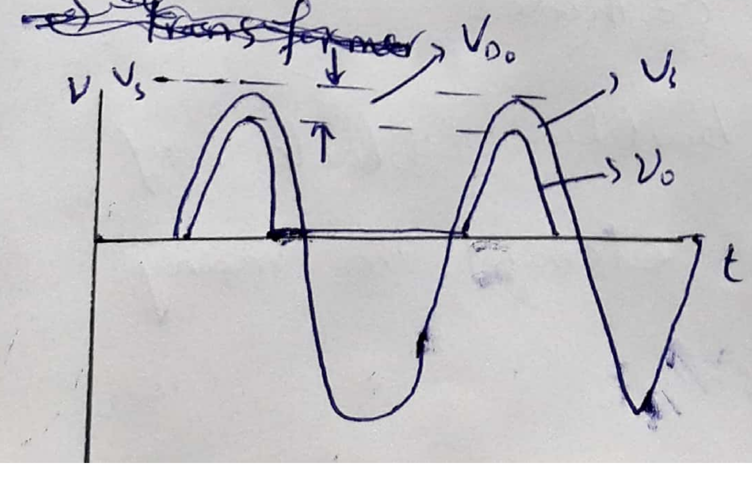
⇒ Positive current normally flows from the anode to the cathode.

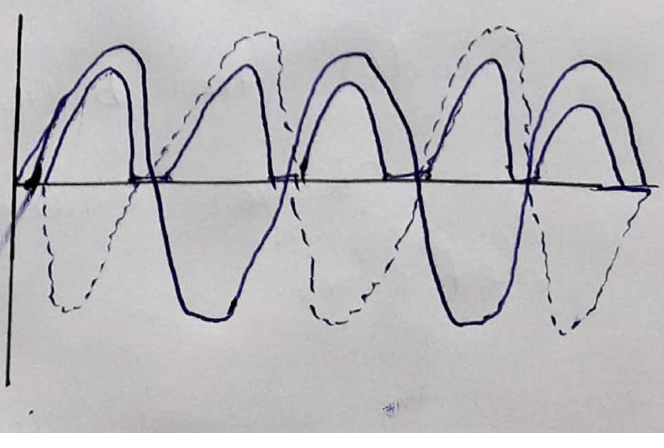
⇒ Diodes are basic building block of the charge - collecting element in many detectors.

Name : Rizwan ullah khan ID = 7807

Diffrentiate b/w Half wave & full wave rectifiers.

Half wave	Full wave
⇒ Half wave rectifiers convert only one half of the AC cyle in to pulsating DC.	⇒ Full wave rectifiers converts entire cycle of AC into pulsating DC.
⇒ It is unidirectional.	⇒ It is bi-directional.
⇒ It allow the conduction in one direction only. It can convert positive half only or negative half only into DC.	⇒ It conduct for positive half as well as negative half of the cycle.
⇒ Efficiancy is 40.6%	⇒ Efficiency is 81.2%





③

Name = Rizwan ullah khan   ID = 2807

Q 1 Part B

Given data:-

Gold Sample at 785°C = 97.0g

water = 323 g

Initial temperature of water = 15°C.

Gold Specific heat = 0.129 J/g°C.

water Specific heat = 4.184 J/g°C

Solution:-

$$-\text{Loss}_{heat} = \text{Gain}_{heat}$$

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

$$-[(0.129\,J/g\,°C)(97\,g)(T_f - 785°C)] = [(4.184\,J/g\,°C)(323\,g)(T_f - 15°C)]$$

Name : Rizwan ullah khan ID = 7807

$$-[(12.5)(T_f - 785°C)] = [(1.35\times10^3)(T_f - 15°C)]$$

$$-12.5T_f + 9.82\times10^3 = 1.35\times10^3 T_f - 2.02\times10^4$$

$$3\times10^4 = 1.36\times10^3 T_f$$

$$\boxed{T_f = 22.1°C}$$

Ans.

Name :- Rizwan ullah khan ID = 7807

Q : 2/ Part(a)

Thermodymic Processes :-

When the Systems undergoes charge from one thermodynamic State to final State due to charge in properties like temperature, Pressure, volume etc. the System is said to have undergone thermodymics processes.

Various type of thermodynamic processes are:

1- Isomatric or Isochoric Process :-

The process, during which the volume of the system remains Contant is called Isocharic Process.

Example :- Heating of gas in closed Cylinder.

Name Rizwan ullah khan = ID = 7807

2- Isobaric Process:-

The process during which the pressure of the System remains Constant is Called as Isobaric Process.

work = $P \Delta V$

3- Iso thermal Energy:-

when the System under goes Change from one State to the other, but its temperature remains Constant is Called Isothrmal process.

4- Adiabatic Process:- The Process during which the heat Content of the System or Certain quantity of the matter remains Constant is Called adiabatic process.

Name = Rizwan ullah khan   ID = 7807

Q:2/ Part B

Given data:-

heat absorb by engine = 600J
temperature = 500K
exhaust temp = 300K

$e = ?$
$W = ?$

Solution:-

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

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

$e = 1 - 0.6 = 0.4$

$e = 0.4 \times 100$

$e = 40\%$

actual $e = 0.5 e_i$
$= 20\%$

$e = \frac{W}{Q_H}$

$W = e Q_H = 0.20(600J)$

work = 120J

Name: Rizwan ullah khan ID = 2807

Q:3/ part a

Heat Engine:-

Heat Engine is a device that transform the Chemical Energy of feul into thermal Energy and utillize this energy to perfor usefull work. So thermal Energy is Converted to mechenical Energy in a Heat engine.

Diffrentiate b/w Internal Combustion & External combustion Engine.

I.C Engine	E.C Engine.
⇒ Combustion of fuel takes place inside the cylinder.	⇒ Combustion of fuel take place out side the cylinder.
⇒ Require Less Space	⇒ Require Large Space.
⇒ Capital Cost is relatively low	⇒ Capital Cost is ralatively high.

Name :- Rizwan ullah khan ID = 7807

⇒ working fluid may be petrol, Desiel & various type of gases.	⇒ working fluid is Steam.
⇒ Fuel Cost is high.	⇒ Fuel Cost is low.
⇒ Thermal efficiancy is high.	⇒ Thermal efficiency is low.
⇒ power development per unit weight of these engines is high.	⇒ power development per unit weight of these engine is low.

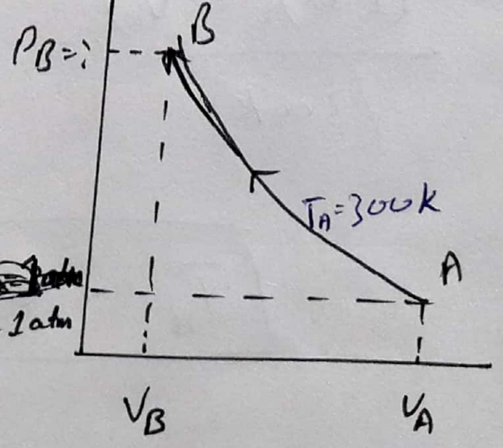
Q: 3 / part B :

Solution :-

$$P_A V_A^{\gamma} = P_B V_B^{\gamma}$$

$$\Delta Q = 0$$

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



Rizwan ullah khan ID = 7807

Solve for P_B :-

$$P_A V_A^{\gamma} = P_B V_B^{\gamma}$$

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

$$P_B = P_A \left(\frac{12 V_B}{V_B}\right)^{1.4}$$

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

$$\boxed{P_B = 32.4 atm \text{ or } 3284 kPa}$$

Now Find T_B :-

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

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

$$\boxed{T_B = 810 K}$$

Name - Rizwan ullah khan ID = 7807

Q:-4/ Diffrential b/w Conduction & convection:.

Conduction	Convection
⇒ Heat is transffer due to molecular Collision when Solids Come into Contact with each other	⇒ Heat is transfered by the flow of the fluids.
⇒ Heat travelling from a high temperature area to a low temperature area.	⇒ Heat travelling from low density area to high density area.
⇒ The temperature difference or diffrence in kinetic energy results Conduction.	⇒ The diffrence in density of fluid result in Convection.
⇒ Conduction occurs only in Solids.	⇒ Convection occurs by flow of energy in fluids.
⇒ Heat flow rate increases with area and temp: drop.	⇒ The faster the fluid motion, greater the Convection heat transfer.

Name : Rizwan ullah khan
ID = 7807

Q: 4/ Part B

Given data:-

Sp. Heat of water = 4.18 J/g.°C
Piece of lead mass = 75.0 g
lead initial temp = 435°C
water mass = 125.0 g
water initial temp = 23.0°C

Final temp. of mixture = ?

Solution:-

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

$$m_w C_w \Delta T_w = -(m_{Pb} C_{Pb} \Delta T_{Pb})$$

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

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

$$+9.75\,T_f + 12017.5 = +9.75\,T_f + 12017.5$$

$$532.25\,T_f = 16258.75$$

Name = Rizwan ullah khan ID = 7807

$532.25\, T_f = 16258.75$

$$T_f = 30.5\,^\circ C$$

Q: 5/ Given data:-

Length of roof = 6 m
width of roof = 8 m
Thickness of roof = 0.25 m
Conductivity = k = 0.8 W/m.°C

Temp: one night = 25°C and 0°C for 10 hours.

Rate of heat loss = ?

Cost of that heat loss = ?

rate of electricity = $0.2/kWh.

Name - Rizwan ullah khan - ID = 7807

Solution:-

⇒ Nothing that heat transfer through the roof is by conduction.

$A = 6m \times 8m = 48m^2$

Stead rate of Heat transfer is

$\dot{Q} = KA(T_1 - T_2)/L = (0.8)(48)(25-0)/0.25$

$\dot{Q} = 3840W = 3.84\,kW.$

So The amount of heat lost during 10 hours.

$Q' = \dot{Q}\cdot\Delta t = (3.84\,kW)(10\,h) = 38.4\,kWh.$

$\boxed{Q' = 38.4\,kWh}$.

Now

Cost/day = (Amount of energy)(unit cost of energy)

$= (38.4\,kWh)(\$0.2/kWh) = \$7.68$

$\boxed{Cost/day = \$7.68}$

Cost/month = (Cost/day) × (30 day/month)

$= \$7.68 \times 30 = \$230.4$

$\boxed{Cost/month = \$230.4}$