Name — Farhat Mohi Khan

ID — 7883

Submitted to — Sir Engr Ashraf Ali

Semester — 6th

Section — B

Date — 26-09-020

Subject — Basic electro mechanical Engineering

Scanned with CamScanner

Q:.No:.01

Part: a

What is Diode? Differentiate b/w Half-wave rectification and Full-wave rectification.

Ans: **Diode:**

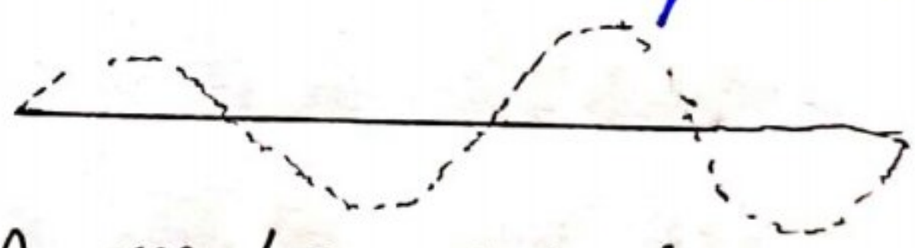
Diode is a electronic component which Limits the current in one direction It consists of anode & cathode respectively.

Half Wave Rectification

- The flow is in interval which shows there is a gap region between two adjacent waves

$\gamma_D < R$

Full wave rectification



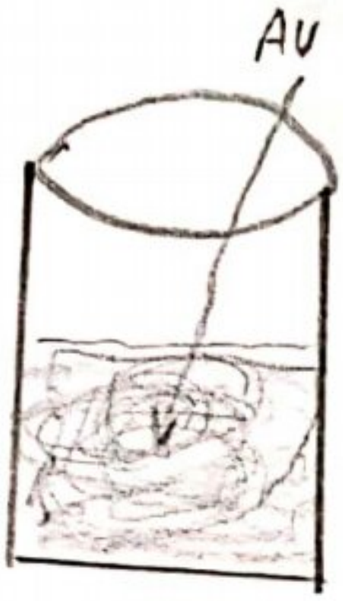
- A regular wave form is seen thus this is a continuous wave form
- $R > 0$

Q:NO:: 01

Part (b)

Given data:

$T = 785^{\circ}C$



Mass = 97.0 g

$T = 15.0^{\circ}C$

Mass = 323 g

Water specific Heat = 4.184 J/g°C

Required:

$T_f = ?$

Sol:-

$$-\text{Los heat} = \text{GAIN heat}$$

$$-[(CAU)(Mass)(\Delta T)] = (CH_2O)(Mass)(\Delta T)$$

$$-[(0.129\ J/g^{\circ}C)(97g)(T_f - 785^{\circ}C)] = (4.184\ J/g^{\circ}C)(323g)(T_f - 15^{\circ}C)$$

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

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

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

$$\boxed{T_f = 22.1^{\circ}C} \rightarrow \text{Ans}$$

Scanned with CamScanner

Q:No:02

Part: a

Ans:

(i) Iso Baric Process:

It is a system of energy in which the Pressure remains constat there is a increase in Heat energy with the increase in the internal energy

$$\Delta Q = \Delta U + \Delta W$$

(ii) Isometric Process:

In this system there is no change in the volume i.e volume is constant.

$$\Delta Q = \Delta U + \Delta \cancel{W}^{0}$$

$$\Delta Q = \Delta U$$

(iii) Iso thermal Process:

In this system there constant temperature thus $\Delta U = 0$ so

$$\Delta Q = \Delta W$$

(iv) "Adiabatic Process":

In this system, no energy is being taken in or out of the system thus

$$\Delta W = -\Delta U$$ (-ve sign indicates the gain in energy

Q:- No:-02

Part b: A steam engine absorbs 600j of heat at 500k and the exhaust temperature is 300k. if the actual efficiency is only half of the ideal efficiency. how much work is done-

Sol:-

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

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

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

Actual $e = 0.5 e_i = 20\%$

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

$$W = eQ_H = 0.20\ (600j)$$

$$\boxed{\text{Work} = 120\ J}$$

Q:No:: 03 05

Part: 2

Internal combustion engine	External combustion engine.
• Temperature is higher	• Temperature is lower
• Pressure is higher	• Pressure is lower.
• It is costly	• Its cheaper comparatively
• less time required to start.	• More time required to start
• Fuel tank required to start	• ~~More time required~~ Water storage required to generate steam.
• Pressure generate inside the engine is due to combination of fuel.	• Pressure generated inside the engine is due to steam of water

Scanned with CamScanner

Q:NO:03 06

Part: b

Sol:

$$\Delta Q = 0$$

Find $P_B \rightarrow P_B = P_A \left[\frac{V_A}{V_B}\right]^{\gamma}$

$$P_B = P_A \left[\frac{12 V_B}{V_B}\right]^{1-4}$$

$$P_B = (1 atm)(12)^{1-4}$$

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

Now Find T_B

$$\Delta Q = 0$$

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

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

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

Scanned with CamScanner

Q: No: 04 07

Part a

Difference b/w Conduction & Convection

Conduction	convection
• The movement or increase in kinetic from higher concentration to region of low concentration	• The flow of energy in the same direction of the liquid or gasr
• It happen in solid	• More the kinetic energy more will be convection.
• Transfer of heat occurs due to localized electrons	• Example: Heat transfer from hot surface to air is type of convection.
• continuous until object temperature are equal	• cycle occurs which temperature different exist.

Q:No:04 08

Part: b

Sol:-

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

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

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

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

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

$$532.25\,T_f \qquad\qquad 10258.75$$

$$\boxed{T_f = 30.5^{\circ}C}$$

Q:No:05 09

Sol: The inner and outer surface of the flat concrete roof of an electrically heated home are maintained at specific temperature during a night. The heat loss through the roof and its cost that night are to be determined.

Assumption 1:

Steady operating exists duryg the entire night since the surface temperature of the roof remains ~~cond~~ constant at the specified value.

Assumption:2:

Constant Properties can be used for the roof.

Properties:

The thermal conductivity of the roof is given by $k = 0.8\ W/m.C^{\circ}$

Analysis: A) Nothing that heat transfer through the roof is by conduction & the area of the roof is $A = 6M \times 8M = 48M$ the steady rate of heat transfer through the roof is.

$$Q = k_n \frac{T_1 - T_2}{L} = (0.8\ W/m\cdot C)(48\ m^2)\frac{[25-0]\ C}{0.25} = 3.84\ kW$$

b) The amount of heat lost through the roof during a 10 hour period and its cost is.

$$Q = Q\Delta L = (3.84\ kW)(10\ h) = 38.4\ kWh$$

$$\text{Cost} = (\text{Amount of energy})(\text{unit cost of energy})$$

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