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I-D = 7671

Section = Senior.

Semester = Summer (Final)

Subject Name = Basic Electro Mechns.

Exam = Final (Summer)

Date = 26-09-2020

IQRA NATIONAL

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QNO # 01:-

part (a):-

Diode:-

A diode is an electronic component that; has two terminals, limit current to one direction.

* Diodes have an anode & a Cathode.
* positive current Normally flows from the anode to the Cathode.
* Diodes are useful for protecting Circuitry from harmful voltage or Current.
* Diodes are a basic building block of the charge - collecting elements in many detectors.

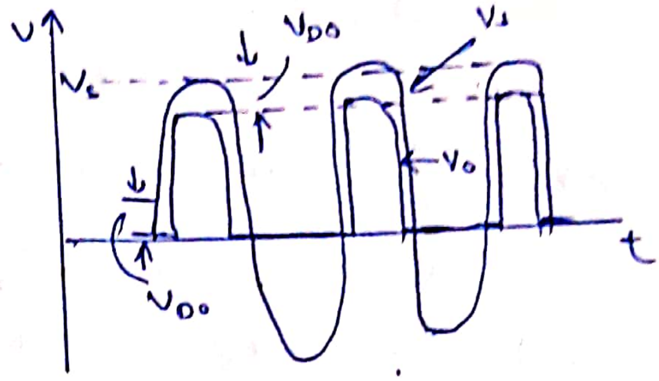
Differentiate between Half-wave rectification & full-wave rectification.

* Half-wave rectification:-
* full-wave rectification:-

a) Half-wave rectification.

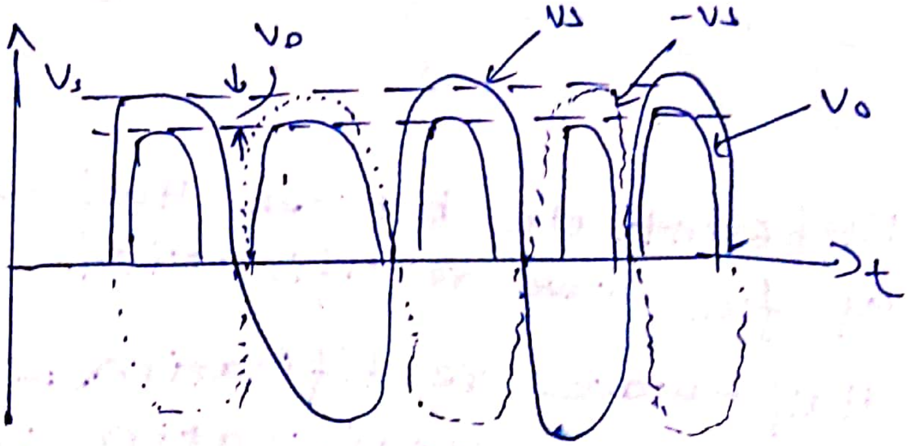
equivalent Circuit of the half wave rectifier with the diode replaced with its battery-plus-resistance model.

* Transfer characteristics of the rectifier Circuit.
* Input & output wave-forms, assuming that $r_D << R$



Full wave rectification:-

* Circuit.
* transfer Characteristic assuming a Constant-voltage-drop model for the diodes



OR

A half wave rectification is an electronic Circuit which Converts only one-half of the AC Cycle into pulsating DC. Its utilizes

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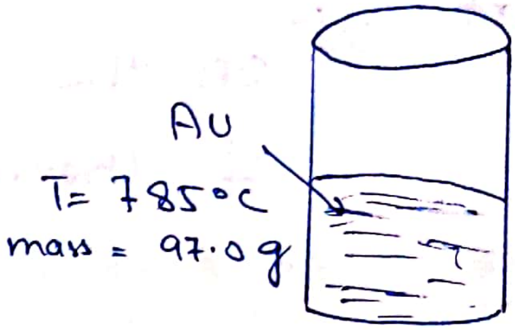
only half of AC Cycle for the Conversion process. on the other hand, Full wave rectifier is an electronic Circuit which Converts entire Cycle of AC into pulsating DC.

QNO# 01:

Part (B):-



Solution:-

$T = 15.0°C$

$mass = 323g.$

$-$ LOSE heat = GAIN heat.

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

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

$$-[(12.5)(T_f - 785°C)] = [(1.35 \times 10^3)(T_f - 15°C)].$$

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

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

$$T_f = 22.1\ °C.$$

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QNO# 02,

Part (a):-

on the basic of First Law of thermodynamics:-

* the net heat put into a System is equal to the change in internal energy of the System plus the work done By the System.

$$\Delta Q = \Delta U + \Delta W \quad \Delta = (\text{Final} - \text{initial})$$

* Conversely, the work done ON a System is equal to the change in internal energy plus th heat lost in the process.

$$\Delta Q = \Delta U + \Delta W \quad \Delta = (\text{Final} - \text{initial})$$

thermodynamic processes-

* Isochoric processes: $\Delta V = 0$, $\Delta W = 0$,
* Isobaric process: $\Delta p = 0$,
* Isothermal process: $\Delta T = 0$, $\Delta U = 0$,
* Adiabatic process: $\Delta Q = 0$.

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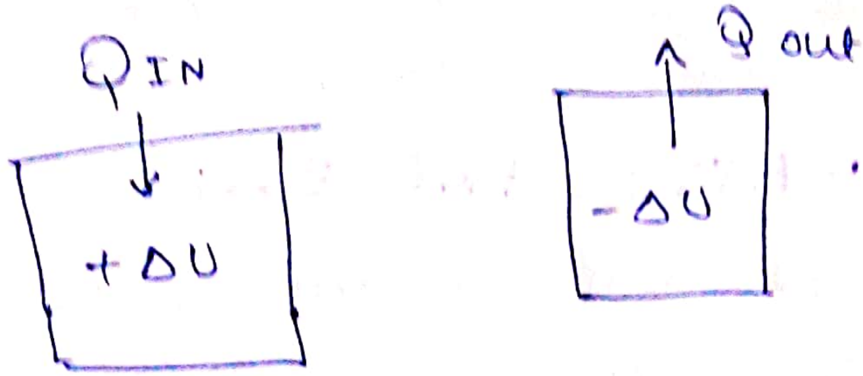
ISOCHORIC PROCESS:-

Constant volume, $\Delta V = 0$, $\Delta W = 0$.

$\Delta Q = \Delta U + \Delta W$ so that $\Delta Q = \Delta U$.



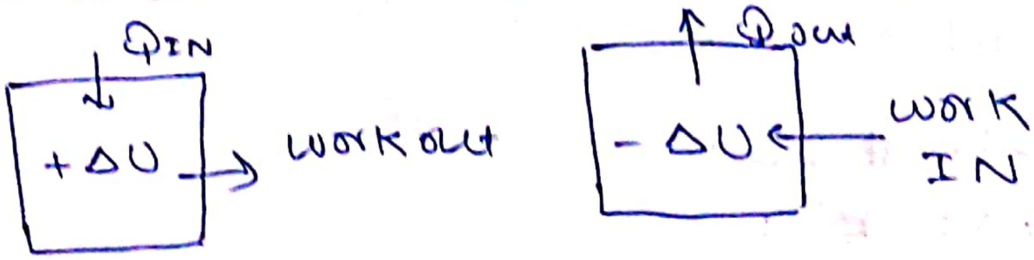
Heat IN = Increase in internal energy.

HEAT OUT = decrease in internal energy.

ISOBARIC PRCOCESS:-

Constant pressure, $\Delta P = 0$.

$\Delta Q = \Delta U + \Delta W$ But $\Delta W = P \Delta V$



HEAT IN = Wout + Increase in internal energy

HEAT OUT = Wout + Decrease in internal energy

ISOTHERMAL PROCESS:-

Constt. Temperature, $\Delta T = 0$, $\Delta U = 0$.

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

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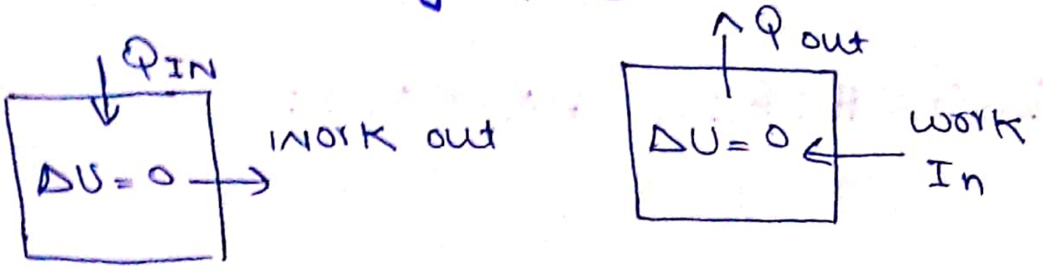


NET HEAT INPUT = WORK OUTPUT.

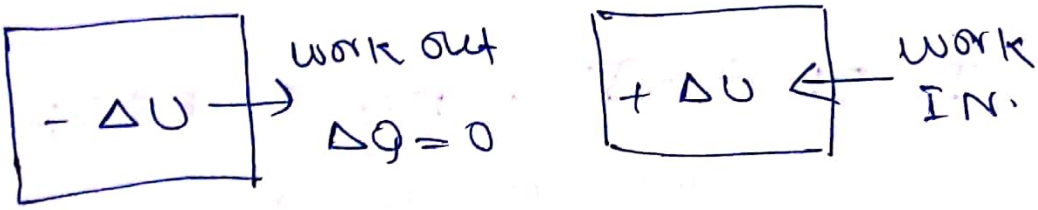
WORK INPUT = NET HEAT OUT.

⇒ ADIABATIC PROCESS:-

NO HEAT EXCHANGE, $\Delta Q = 0$

$\Delta Q = \Delta U + \Delta W$; $\Delta W = -\Delta U$ or $\Delta U = -\Delta W$

$\Delta W = -\Delta U$ $\quad\quad$ $\Delta U = -\Delta W$



WORK done at EXPENSE of internal energy.

INPUT WORK INCREASE internal energy.

Q NO# 02 :

part (B) :-

Sol :-

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

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

$$e = 40\%$$

Actual $e = 0.5e_1 = 20\%$

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

$$W = eQ_H = 0.20(600\,J)$$

$$WORK = 120\,J$$

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QNO# 03

Part (A) Differentiate b/w internal combusbion engine & external combustion engine:-

Interal Combustion engine	External Combustion engine:-
* Temperature is higher.	* Temporature is lower.
* pressure is higher.	* pressure is lower.
* It is costly.	* It is cheaper comparatively.
* less time required to start.	* More time required to start.
* Fuel tank required to start.	* water storage required to generate stream.
* pressure generate inside the engine is due to combustion of fuel.	* pressure generated inside the engine is due to stream of water.

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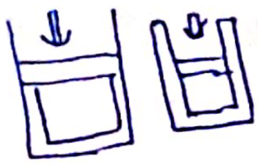
Part (B) :-



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

$$\Delta Q = 0.$$

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

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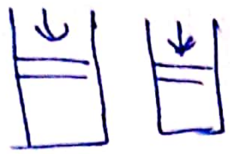
$P_B = (1\ atm)(12)^{1.4}$

$P_B = 32.4\ atm$
or 3284 kPa.



$\Delta Q = 0$

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

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

$$T_B = 810\ K$$

QNO# 04 :
Part (A) :- Differentiate b/w Conduction & Convection.

Conduction	Convection
* the movement or increase in kinectic from higher of lower Concentration	* the flow of energy in the Same direction of the liquid or gas.
* It happen in Solid	* More the kinectic energy more will be Convection. Example:- Heat transfer from hot Surface to air is type of Convection.
* Transfer of heat occurs due to co-calized electrons.	
* Continous until object Temperature are equal	* Cycle occurs while Temperature difference exist.

Q No# 04:-

part (B):- A 75.0 g piece of lead (Specific heat = 0.130 J/(g°C)), initially at 435°C, is set into 125.0 g of water, initially at 23.0°C. What is the first temperature of the mixture?

Sol:-

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

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

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

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

$$+9.75T_f \quad +12017.5 + 9.75T_f + 12017.25$$

$$532.25T_f = 16258.75$$

$$T_f = 30.5°C.$$

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QN O# 05:-

Sol:- the inner ey outer Surface of the flat Concrete roof of an electrically heated home ey maintained at Specific Temperature during a night. the heat loss through the roof ey its lost that night are to be determined.

Assumption 1:

~~the thermal~~ Steady operating exists during the entire night Since the Surface temperature of the roof remain Constant at the Specific value.

Assumption 2:-

Constant properties Can be used for the roof.

properties:- the thermal Conductivity of the roof is given by $K = 0.8\,W/m \cdot ^\circ C$.

Analysis:-

(a) Nothing that heat transfer through the roof is by Conduction ey the area of the roof is-

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

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the Steady rate of heat transfer through the roof is.

$$\dot{Q} = kA \frac{T_1 - T_2}{L} = (0.8\, W/m)(48\, m^2) \frac{(25-0)C^\circ}{0.25\, m} = 3.84\, KW$$

(B):- the amount of heat lost through the roof during a 10 hours period & its cost is

$$Q = \dot{Q}\Delta t = (384\, Km)(10h) = 38.4\, KWh$$

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

$\Rightarrow$ (38.41 KWh)(0.2/KWh) = \$ 7.68.

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the End:-