Name:- Muhammad Jalal Khan
ID :- 16089
Department:- BS (Civil Engineering)
Section:- "A"
Subject:- Basic Electro Mechanical
Submitted to:- Sir Ashraf Ali
Date:- 26th Sep. 2020

Q1) what is Diode ? Differentiate between Half-wave (a) rectification and full-wave reaction?

Ans:- Diode:-

A diode is an electronic component that has two terminals limits current to one direction.

* Diodes have anode and a cathode.
* Pasitive current normally flows from the anode to cathode.
* Diodes are weful for protecting circuitry from harmful voltage or current.
* Diodes are a basic building block to the charge-collecting element in many detectors.

* Half-wave Rectifier

Equivalent circuit of the half wave rectifier with the diode replaced with its battery-plus resistance model.

* Transfer characteristic of the rectifier circuit.
* Input and output waveforms, assuming that $<<R$.

Half wave rectification removes just the negative voltage component using a single diode before converting to D.C

input and output curves

* full-wave rectification:

The negative component of the input voltage to a positive voltage, then converts it into DC (Pulse current) utilizing a diode bridge configuration in contrast. circuit, transfer characteristic assuming ~~voltage~~ constant voltage- drop model for the diodes.

Input and output curves.

B) A 97.0 g - - - - - - - - - - (water specific heat = 4.184 J/g°c)

Solution: Required: Final temperature of mixture

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

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

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

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

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

$$3\times10^{4} = 1.36\times10^{3}\,T_f$$

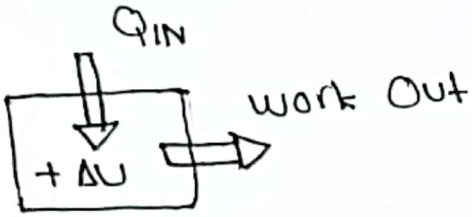
$$T_f = 22.1^{\circ}C$$

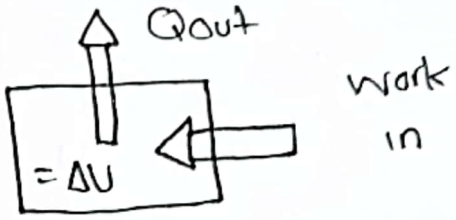
(Q2) Explain the Isobaric Process, Isometric Process
A) Isothermal process and adiabatic process on the basic of basis of first Law of Thermodynamics.

Ans: ISOBARIC Process:-

Constant Pressure $\Delta P = 0$

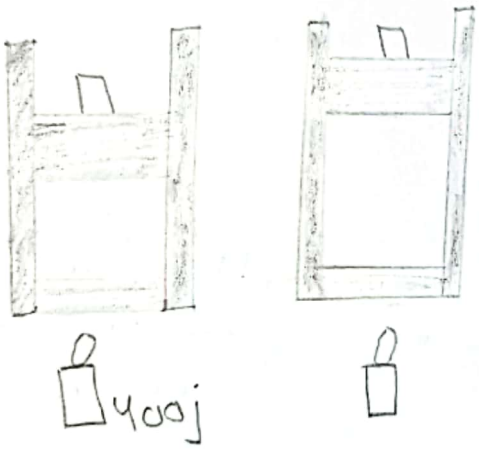
$\Delta Q = \Delta U + \Delta W$ But $\Delta W = P\Delta V$



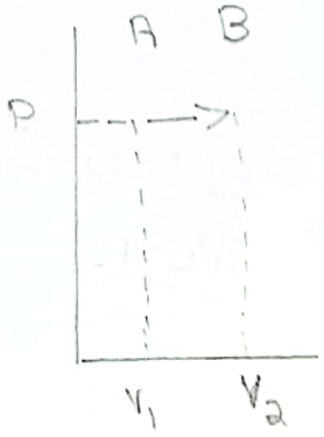


Heat IN = Wout + Increase in Internal Energy
Heat OUT = Wout + Decrease in Internal Energy.

Example:-



Heat input increases V with const P



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

400 J heat does 120 J of work increasing the internal energy by 280J.

ISOTHERMAL Process:

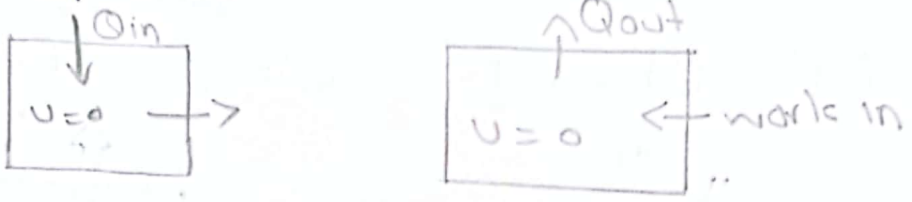
Constant temperature $T = 0$

$U = 0$

$Q = U + W$

and

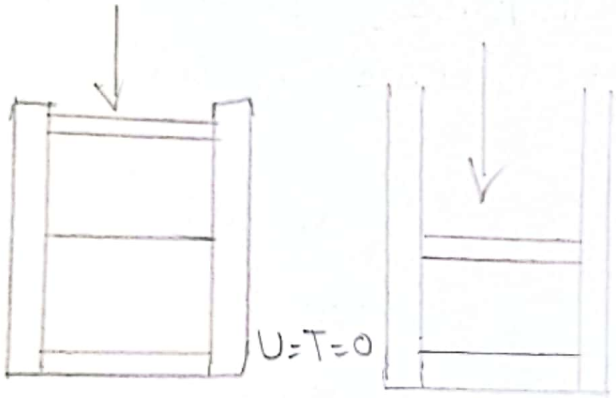
$Q = W$



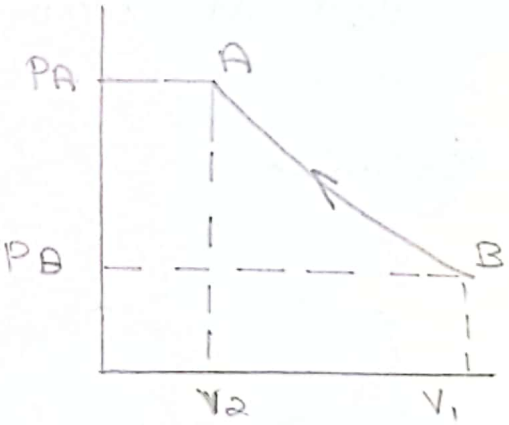
Net heat input = work out put

work input = Net heat out

Example:



$P_A V_A = P_B V_B$



Slow temperature

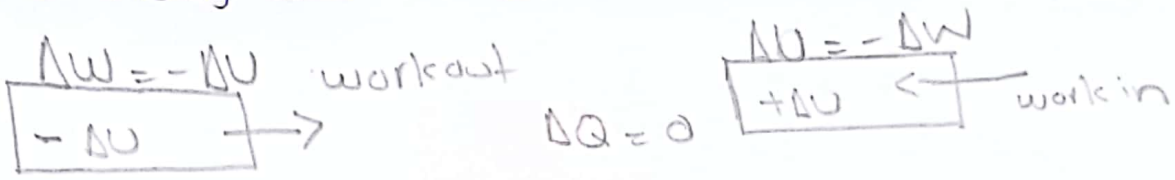
constant temperatu

No change in U

Adiabatic Process:

No heat exchange $\Delta Q = 0$

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



work done at Expense of internal working

Energy input work increase internal energy.

Q2 (6)

(B) A Steam engine absorbs 600J - how much work is done.

Sol:-

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

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

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

Actual $e = 0.5e_i = 20\%$

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

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

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

Q3) a) Differeniate between internal combustion engine and external combustion engine.

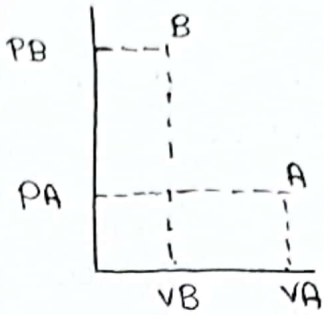
Ans

Internal Combustion Engine	External Combustion Engine.
1) Name it self says that, combustion take place inside the cylinder	* Name it self says that Combustion take place outside the cylinder.
2) Temperature is higher.	* Temperature is lower.
3) Pressure is higher.	* Pressure is lower.
4) In IC engine piston and Connecting rod is use	* In EC engine Stuffing box is use
5) Efficiency is higher	* Efficiency is lower.
6) Lighter in weight	* Heavy in weight.
7) IC engine is costly	* EC engine is cheaper compared to IC engine.
8) Less time required to start	* More time required to start
9) Pressure generated inside the engine is due to combustion of fuel	* pressure generated inside the engine is due to steam of water
10) Fuel tank required to store fuel	* Boiler and water storage required to generate steam.

(Q3)
(B)

Sol:-

(A) $\Delta Q = 0$



$P_A V_A = P_B V_B$

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

$\Rightarrow$ Find P_B

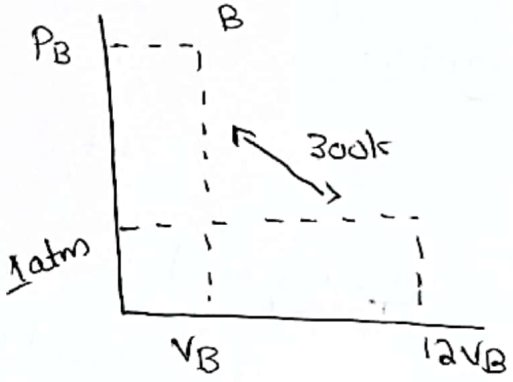
$P_A V_A = P_B V_B$

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

$P_B = 32.4$ atm

or

$P_B = 324$ kPA

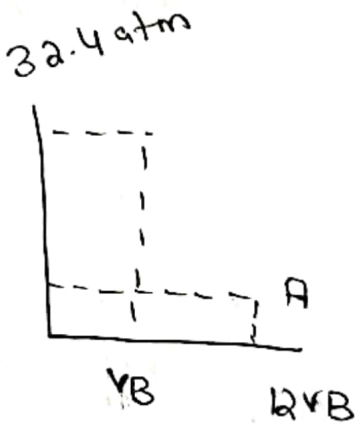


To find T_B

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

$\Rightarrow \frac{1 \times 12}{300k} = \frac{(32.4)(1)}{T_B}$

$T_B = 810k$



Q4) a) Differeniate between Conduction and Convection. (9)

Ans)

Conduction	Convection
It is the transfer of heat by direct physical contact.	It is the transfer of heat by the motion of a fluid.
It is due to temperature difference. Heat flows from high temperature region to low temperature region	It is due to difference in density Heat flows from low density region to high density region.
It occurs in solids through molecular collisions without actual flows of matter.	It occurs in fluids by actual flow of matter
It is a slow process.	It is also a slow process
It does not obey the laws of reflection and refraction.	It does not obey the Laws reflection and refraction

Q4 A 75.0g Piece ---------- of the mixture? (10)

(B)

Sol:

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

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

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

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

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

$$532.25\,T_f = 16258.75$$

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

Q5)

Given $T_1 = 15C$

$T_2 = 4C$

$L = 0.25m$

Required

Solution:

The inner and outer surface of flat concrete roof electrically heated are home are maintained at specified Temp during night.

Accumption:

Steady operating Condition exists during the entire night since the roofs temperature remain constant.

2. Constant properties can use for Anylasis. Nothing that heat Transfer through the roof is condition and are of roof is

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

The steady rate of heat transfer through the roof is determined by

$$Q = \frac{kA(T_2 - T_2)}{L}$$

$$= (0.8)\ \frac{(48)\ (25.0)}{0.25}$$

$$= 3840\ km$$

$$= 3.84\ km$$

The amount of heat left through the roof during at 10 hours period ats cost determined from

$$Q = Q\Delta T$$

$$= (3.84\ kw)\ (10h)$$

$$= 38.4\ kwh$$

So cost Per day = (Amount of energy)(Unit cost energy

$$(38.4\ kwh)\ \ (10.2/kwh) \quad = \$\ 7.68$$

$$\text{Cost/month} = \text{cost/dy} \times 30\text{days}$$

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