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Subject = Basic electro mechanical Engineering

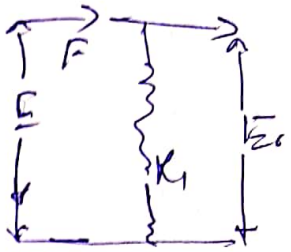
Semester = 2nd final

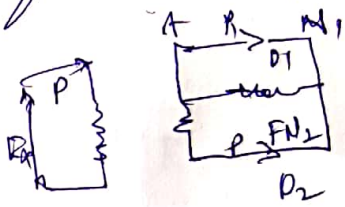
Q1 A

Answer:

Diode :- A diod is on electric component that has two terminal, limit current to be directed diodes have anode and cathode positive - current normally flows from anode to cathode. diode are usefully for protecting circuitry from harmful voltage or current. diodes are a basic building lock of charge-collecting element in many deteder

Half-wave rectifier full wave rectifier





one diode or one Semi-conduli- In this two diods or one double under diode is used. diod or two junction one used

→ ordinary transformer is used Center tap transformer is used

→ of converts half cycle of ac converts the whole cycle of applied Ac. Single into D.C Single into D.C

The value of $I_{rms} = \frac{I_o}{2}$, $I_{rms} = \frac{I_o}{\sqrt{2}}$

$\Rightarrow I_{dc} = \frac{I_o}{\pi}$, $I_{dc} = \frac{2I_o}{\pi}$

The value of ripple factor, the value of γ is it is 48.2%

$$\gamma \sqrt{\left(\frac{I_{rms}}{I_{dc}}\right)^2 - 1} = 121\%$$

Q1 (B)

D-2

Solution

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

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

$$\Rightarrow -[(0.128\ J/g^\circ C)(97g)(T_f - 785^\circ C)] = (4.184\ J/g^\circ C)(323g)(T_f - 15^\circ C)$$

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

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

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

$$T_f = 22.1^\circ C$$

Q2 A

Answer

Isobaric process:- An isobaric is a thermodynamics process in which the pressure stays constant $\Delta p = 0$ the heat transfered to the system does work. but also change the internal energy of the system. using this convention by the first law of thermodynamics, where W is work U is internal energy and Q is heat.

Isometric process:- In this isochoric process, also called a constant-volume process an isovolumetric process or an isometric process is a thermodynamics process during which the volum of the closed system undergoing such a process remain constant.

Isothermal process:- An isothermal process is a thermodynamics process in which the tramprature of a system remain constant. The transper of heat into or out of the system happens so slowly that thermal equilibrium is maintained.

Adiabatic process:- An adiabatic process occours without transferring heat or mass between a thermodynamics system and its surrounding unlike an isothermic process an adiabatic process transper energy to the surrounding only as work.

Q2 B

Solution

P. 4

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

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

$$e = 40\%$$

Actual $e = 0.5 e_1 = 20\%$

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

$$W = e Q_H$$

$$W = 0.20 (600J)$$

$$Work = 120J$$

Q3

A

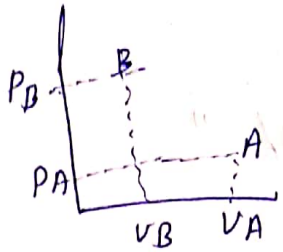
Answer

Internal Combustion Engine	External Combustion Engine.
→ Name it self says that Combustion take place inside the cylinder.	→ Name it self says that Combustion take place ouside the Cylinder.
→ Temperature is higher	→ Temperature is lower.
→ pressure is higher	→ pressure is lower.
→ In IC engine, piston and connecting rod is used	→ In Ec Engine, stuffing box is used.
→ Efficiency is higher.	→ efficiency is lower.
→ Lighter in weight	→ heavy in weight.
→ Ic Engine is costly.	→ Ec engine is cheaper.
→ less time required to start	→ more time required To start.
→ pressure generated inside the Engine is due to combustion of fuel	→ pressure is inside the engine is due to steam of water.
→ fuel Tank is required to store fuel.	→ Boiler and water storage is required to generated steam

Q3 B

Solution

$\Delta Q = 0$



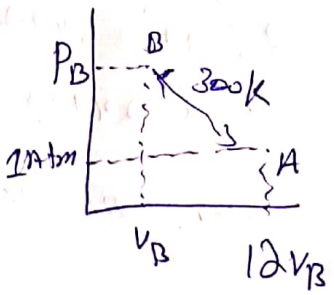
$P_A V_A^{\gamma} = P_B V_B^{\gamma}$

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

⇒ find P_B

$P_A V_A = P_B V_B$

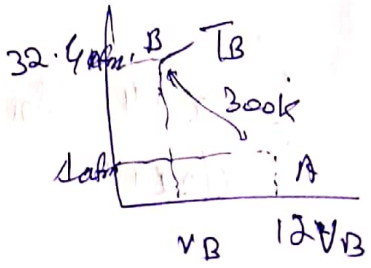
$P_B = P_A \left(\frac{V_A}{V_B}\right)^{\gamma}$



$P_B = 32.4$ atm

or 3284 kPA

⇒ find T_B



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

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

$T_B = 810\,K$

Q4 A

p-7

Answer

Conduction	Convection
→ In Conduction, the heat transfer takes place between objects by direct contact.	→ In Convection the heat transfer takes within the fluid
→ The heat transfer takes place due to the difference in temperature.	→ The heat transfer due to the difference in density.
→ The heat transfer in Conduction is slow.	→ The heat transfer in Convection is faster.
→ The heat transfer occour through a heated solid object.	→ The heat transfer occurs through intermedial objects. For example heat transfer between air and water.
→ It does follow the law of reflection and refraction	→ It does not allow the law of reflection and refraction.

Q4 B/C

Solution

$$\Rightarrow \quad Q_{water} = Q_{pb}$$

$$\Rightarrow m_{water} C_{water} \Delta T_{water} = -(m_{pb} C_{pb} \Delta T_{pb})$$

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

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

$$\Rightarrow + \quad 9.75 T_f + 12017.5 = +9.75 T_f + 12017.5$$

$$532.25 T_f = 16258.75$$

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

Solution

→ Noting that heat transfer through the roof is by conduction and the area of the roof is

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

The steady rate of heat transfer through the roof is determined to be;

$$Q = kA(T_1 - T_2)/L = (0.8)(48)(25-0)/0.25$$

$$= 3840W = 3.84kW$$

→ The amount of heat lost through the roof during a 10-hours period and its cost are determined from.

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

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

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

Cost/month = Cost/day × 30days

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