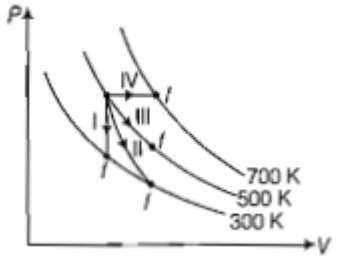
Department of Electrical Engineering
Assignment
Date: 20/04/2020

Course Details

Course Title: Thermodynamics **Module:** 02
Instructor: **Total Marks:** 30

Student Details

Name: MUHAMMAD BILAL KHAN **Student ID:** 16434

Q1.	(a)	Express the temperature of 139 °C on degree Fahrenheit, Rankine and Kelvin scales.	Marks 06 CLO 1
	(b)	Derive the equation highlighting the work done by a gas or vapour in expanding for a constant temperature process.	Marks 05 CLO 1
Q2.		Analyze the given figure and match column 1 with the correct option of column 2. 	Marks 08 CLO 1
Q3.	(a)	Hydrogen is compressed under a constant pressure of 5760 lb/ft^2 until its volume is reduced from 28 to 12 ft^3. Calculate the work done in compressing the gas.	Marks 07 CLO 1
	(b)	Differentiate between enthalpy and entropy using examples from daily life.	Marks 04 CLO 1

Column 1	Column 2
Process I	Adiabatic
Process II	Isobaric
Process III	Isochoric
Process IV	Isothermal

Question NO 1

Solution:

(1) Fahrenheit:

$^0F=(1.8*^0C)+32$

$^0F=(1.8*139)+32$

$^0F=(250.2)+32$

(2) Kelvin :

$K=^0C+273$

$K=139+273$

$K=412K$

(3) Rankine:

$^0R=(1.8)K$

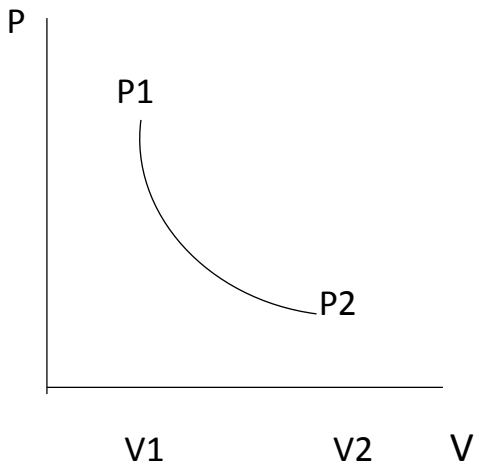
$^0R=(1.8)(412)$

$^0R=741.6$

Question NO 1 (B)

Isothermal Process :

Here the gas will expand during external work equal to the amount of heat supplied.



Mathematically:

$$W = \int_{V_2}^{V_1} P\,dv$$

$$P_1 V_1 = P_2 V_2 = PV = C \quad ,$$

so, $P = \frac{C}{V}$

equation (1) becomes

$$W = \int_{V_2}^{V_1} \frac{C}{V}\,dv$$

$$W = C \int_{V_2}^{V_1} \frac{1}{V}\,dv$$

$$W = C \ln V \Big|_{V_2}^{V_1}$$

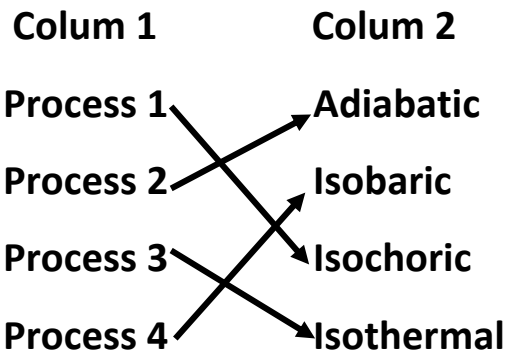
$$W = C\left[\ln(V_1 - V_2)\right]$$

$$W = C\left[\ln V_1 - \ln V_2\right]$$

$$W = C \ln\left(\frac{V_1}{V_2}\right)$$

$$\boxed{W = PV \ln\left(\frac{V_2}{V_1}\right)}$$

Question No 2



Question NO 3 (A)

Solution

Given:

$P=5760 lb/ft^2$

$V_1 = 28\ ft^3$

$V_2 = 12\ ft^3$

Required:

Work done =?

Solution :

We know that

$W= -P\Delta V$

$W= -P(V_2-V_1)$

$W= 5760\ (12-28)$

$W=5760(-16)$

$W=92160$

Question NO 3 (B)

Enthalpy:

Enthalpy is equal to the total internal energy of the system plus the product of process and volume .

Mathematically:

$H=E+Pv$

The unit of enthalpy is Joule (J)

Example:

Refrigerator compressor are the example of enthalpy in our daily life .

(2) Entropy :

Entropy is the measure of systems thermal energy per unit temperature that is invaluable for during useful work .

$E=\Delta Q/T$

The unit of entropy is Joule per kelvin (JK^{-1})

Example :

A campfire is the example of entropy.