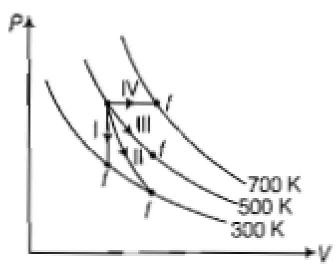
Department of Electrical Engineering
Assignment
Date: 20/04/2020

Course Details

Course Title:	Thermodynamics	**Module:**	02
Instructor:	Sir. MUJTABA IHSAN	**Total Marks:**	30

Student Details

Name:	Muhammad Salman Nasir	**Student ID:**	16664

<table>
<tr><td rowspan="4">Q1.</td><td rowspan="2">(a)</td><td rowspan="2">Express the temperature of 139 °C on degree Fahrenheit, Rankine and Kelvin scales.</td><td>Marks 06</td></tr>
<tr><td>CLO 1</td></tr>
<tr><td rowspan="2">(b)</td><td rowspan="2">Derive the equation highlighting the work done by a gas or vapour in expanding for a constant temperature process.</td><td>Marks 05</td></tr>
<tr><td>CLO 1</td></tr>
<tr><td rowspan="2">Q2.</td><td rowspan="2"></td><td rowspan="2">Analyze the given figure and match column 1 with the correct option of column 2.


<table>
<tr><th>Column 1</th><th>Column 2</th></tr>
<tr><td>Process I</td><td>Adiabatic</td></tr>
<tr><td>Process II</td><td>Isobaric</td></tr>
<tr><td>Process III</td><td>Isochoric</td></tr>
<tr><td>Process IV</td><td>Isothermal</td></tr>
</table></td><td>Marks 08</td></tr>
<tr><td>CLO 1</td></tr>
<tr><td rowspan="4">Q3.</td><td rowspan="2">(a)</td><td rowspan="2">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.</td><td>Marks 07</td></tr>
<tr><td>CLO 1</td></tr>
<tr><td rowspan="2">(b)</td><td rowspan="2">Differentiate between enthalpy and entropy using examples from daily life.</td><td>Marks 04</td></tr>
<tr><td>CLO 1</td></tr>
</table>

Answer No 1:

Part (a):

Given that.

Temperature (T) = 139 ^{o}C

Find,

Fahrenheit (^{o}F) =?

Kelvin (^{o}K) =?

Rankine (^{o}R) =?

Solution:

We know that

$^{o}F = (1.8\times {}^{o}C) + 32$

$= (1.8\times 139) + 32$

$= 250.2 + 32$

$^{o}F = 282.2\ ^{o}F$

$^{o}F = 282.2\ ^{o}F$

For kelvin

$^{o}k = {}^{o}C + 273$

$= 139 + 273$

$^{o}K = 412^{o}K$

$^{o}K = 412^{o}K$

Rankine,

$^{o}R = 1.8\ (K)$

$= 1.8\times 412$

$^{o}R = 741.6\ ^{o}R$

Part (b)

Isothermal process (constant temperature):

An isothermal process is a change of a system, in which the temperature remains constant

$\Delta T = 0$ this is occurs when a system is in contact with an outside hot body (heat source), this process to slow. In an isothermal process, the value $\Delta T = 0$ and therefore the change in internal energy $\Delta U = 0$ (only for an ideal gas).

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

Here,

$\Delta U = 0$

$\Delta Q = 0 + \Delta W$

$\Delta Q = \Delta W$

In isothermal process the internal energy of system remain same and work done is equal to heat supplied to the system.

Work done by gas at constant temperature (isothermal):

As we know that,

$W = PV$

$W = W = \int dW$

$w = \int_{v1}^{v2} p\,dv$ ....(i)

as we know that,

$p_1v_1 = p_2v_2$

$pv = c$

$p = \frac{c}{v}$

put value of (P) in eq (i)

$W = \int_{v1}^{v2} \frac{c}{v}\,dv$

$= c \ \ln \ {}^{v2}/_{v1}$

w = c ln $(\frac{v2}{v1})$

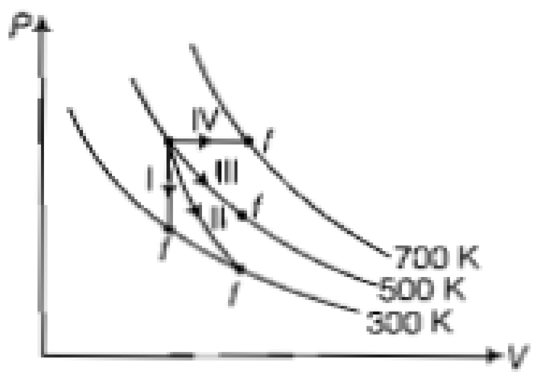
As,

Pv = c

So,

W = p1 v1 ln $(\frac{v2}{v1})$***,,,,,,,,,Ans***

Answer No 2:



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

Answer No 3:

Part (a)

Given that,

Pressure (P) = 5760 lb/ft^2

Volume change = 28 to 12 ft^3

V1 = 28 ft^3

V2 = 12 ft^3

Solution:

As we know that,

Work done at constant pressure is

W =P ΔV

W = P (V2 –V1)

W = 5760 lb/ft^2 × (12 ft^3 - 28 ft^3)

W = 5760 × (-16)

W = -92160 lb.ft

W = -92160 lb.ft…………ans

Or

W = -124952.182 J……ANS

Work done is negative because the volume of gas is reduced.

Answer No 3:

Part (b)

Enthalpy:

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

OR

Enthalpy is the measure of total heat present in the thermodynamic system where the pressure is constant.

H = E + P.V

Unit of enthalpy is joule (j)

Entropy:

Entropy is measure of system thermal energy per unit temperature that is unavailable for doing work.

Or

Entropy is the measure of disorder in a thermodynamic system.

S = $\frac{\Delta Q}{T}$

Unit of entropy is joule per kelvin (J/K).

Enthalpy and Entropy daily life examples:

Entropy:

A campfire is an example of entropy. The solid wood burns and becomes ash, smoke and gases, all of which spread energy outwards more easily than the solid fuel. Ice melting, salt or sugar dissolving, making popcorn and boiling water for tea are processes with increasing entropy in your kitchen.

Enthalpy:

Enthalpy can be used in a variety of laws and equations. Other groups will cover these applications.

Change in enthalpy can apply to refrigerators and hand warmers. In a fridge, refrigerants such as Freon are evaporated. The enthalpy of vaporization (liquid to gas energy change) is equivalent to the coldness of your food.

Some people use chemical heat packs (hand warmers) outside. When you shake the pack, it begins to heat your hands. Various reactants inside the pack are exposed to air. This is another example of change in enthalpy.

Difference between Enthalpy and Entropy:

	Enthalpy	Entropy:
1	Enthalpy is a kind of energy	Entropy is a property
2	It is the sum of internal energy and flow energy	It is the measurement of randomness / disorder ness of molecules
3	It related is applicable in standard conditions	It does not have any limits or conditions.
4	The system favour minimum enthalpy	The system favour maximum entropy
5	It is denoted by symbol H	It is denoted by symbol S
6	Unit is joule (J)	Unit is joule per kelvin (J/K)
7	It was termed by a scientist named Heike Kimberling Onnes	It was termed by a scientist named Rudolf Clausius