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

Course Details

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

Student Details

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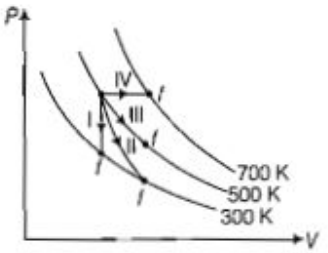
Q1.	(a)	Express the temperature of 139 °C on degree Fahrenheit, Rankine and Kelvin scales.	Marks 06 CLO 1
	(b)	Derive the equation highlighting the work done by a gas or vapour in expanding for a constant temperature process.	Marks 05 CLO 1
Q2.		Analyze the given figure and match column 1 with the correct 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 #01 (part a)

Express the temperature of 139°c on degree Fahrenheit, Rankine and Kelvin scales.

Answer:-

Given:-

Temperature = 139°C

Required Data:-

Fahrenheit, $F^\circ = ?$

Rankine, $R^\circ = ?$

Kalvin, $K^\circ = ?$

Solution:-

Degree fahrenheit:

formula:-

$$F^\circ = (1.8 \times C^\circ) + 32$$

putting values of C°

$F^\circ = (1.8 \times 139) + 32$

$F^\circ = (250.2) + 32$

$F^\circ = 282.2\ F^\circ$.

Kelvin Scales:

formula:

$$K^\circ = (C^\circ + 273)$$

putting values of C°

$$K^\circ = 139 + 273$$

$$K^\circ = 412K^\circ$$

Rankine:

formula:-

$$R^\circ = (F^\circ + 460)$$

putting value of F°

$$R^\circ = 282.2 + 460$$

$$R^\circ = 742.2R^\circ$$

(Part #b)

Derive the equation highlighting the work done by a gas or vapour in expanding for a constant temperature process.

Work done by a gas or vapour in expanding depend on the method by which expansion is perform.

as we know that

$|W| = \int p \, \Delta V$

constant temperature

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

as $p_1 = p_2 V_2 = pV = C$

$p = C/V$

$|W| = \int_{V_1}^{V_2} C/V \, dV$

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

$= C \ln (V_2/V_1)$

$\boxed{|WORK| = p_1 V_1 \ln (V_2/V)}$

QUESTION #02

(part a) :-

Analyze the given figure and match column 1 with the correct option of column 2.

column 1	column 2
process I	Adiabatic
process II	Isobaric
process III	Isochoric
process IV	Isothermal

Answer:-

ideal gas eqn $-pv = NRT$
Isobaric process $-$ constant $\cdot P$
Isochoric process $-$ constant $\cdot V$
Isothermal process $-$ constant $\cdot T$
Adiabatic process $-$ no exchange of heat or mass.

Question #03

(part a):-

Hydrogen is compressed under a constant pressure of 5760 lb/ft^2 until its volume is reduced from 28 to 12 ft^2. calculate the work done in compressing the gas.

Answer:-

Solution:-

$P = 7560 lb/ft^2$
$V_2 = 28 ft^3$
$V = 12 ft^3$

Required:- Work done = ?

Solution is an constant pressure ~~work~~

work done = $(P)V_2 - V_1$

putting values:

$= 46 \times 144 (28 - 12)$
$= 40 \times 144 (16)$
$= 120,960 ft - lbf$

(Part#b):-

Differentiate between enthalpy and entropy using examples from daily life?

Answer:-

Explanation of terms entropy and enthalpy which are related to physics sub topic of thermodynamics using analogy from social lives of human, thus below is the explanation.

A group of young friends in the peak of their youth is very energetic and needs a large play ground to play football or hockey etc. while, when the same group of friends becomes ~~only~~ old they become less energetic and then they only need a corner in a small coffee shop to sit together and remember the days of their youth, the memories of those days when they were more energetic and they always wanted to wander here and there.

They always wanted to play and run fast therefore they wanted permissions from their parents to participate in sports that could even harm them so they wanted more allowances, liberties and freedoms from their parents, because such allowances are demand of their energy.

Example:-

Imagine a football tightly filled with air and a large empty balloon which you want to fill by transferring all of the football's air to the balloon, while doing so you are giving the air in football an opportunity to show off its energy (ethalpy) by giving gifting size (entropy) a large as the enthalpy or energy of this air is. An interesting facts also worth noting is that when you release the air in the football to the large balloon, you also increase the hunger or thirst of this air for heat or warmth from nearby objects surrounclings or environment because now this air (after being released has become cooler and as you know that cool things absorb heat energy from surrounding environment on the other hand when earlier we put the air in football previously it turned hence this warmer air tried to release its warmth to the environment.