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

Course Details

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

Student Details

Name: Junaid ur rehman **Student ID:** 11484

<table>
<tr><td rowspan="2">Q1.</td><td>(a)</td><td>Express the temperature of 139 °C on degree Fahrenheit, Rankine and Kelvin scales.</td><td>Marks 06</td></tr>
<tr><td></td><td></td><td>CLO 1</td></tr>
<tr><td rowspan="2"></td><td>(b)</td><td>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>
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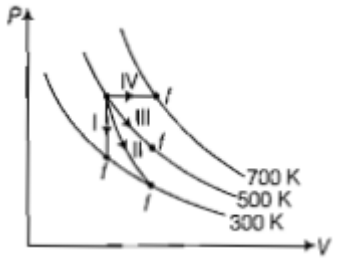
<tr><td rowspan="2">Q2.</td><td rowspan="2"></td><td rowspan="2">Analyze the given figure and match column 1 with the correct option of column 2.
 

<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="2">Q3.</td><td>(a)</td><td>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>
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<tr><td rowspan="2"></td><td>(b)</td><td>Differentiate between enthalpy and entropy using examples from daily life.</td><td>Marks 04</td></tr>
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NAME# Junaid-ur Rehman ID# 11484

Q1 (a) Express the temperature of 139° on degree fahrenheit, Rankie and Kelvin Scales?

Sol#

1) fahrenheit #

$$°F = (1.8 \times °C) + 32$$
$$°F = (1.8 \times 139) + 32$$
$$\boxed{°F = 282.2 F°}$$

2) Rankine #

$$°R = °F + 460$$
$$°R = 282.2 + 460$$
$$\boxed{°R = 742.2 R}$$

3) Kelvin #

$$°K = °C + 273$$
$$°K = 139 + 273$$
$$\boxed{°K = 412 K°}$$

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Q1(b) :- Derive the equation that work done by a gas or vapour in expending for a constant temperature process?

Ans :-

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

As

$$P_1V_1 = P_2V_2 = PV = C$$

$$\Rightarrow P = \frac{C}{V}$$

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

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

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

$$\boxed{\text{Work} = P_1V_1 \ln \left[\frac{V_2}{V_1}\right]}$$

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Q2# Analyze the given figure and match column 1 with the correct option of column 2

Column 1	Column 2
Process 1	Adiabatic
Process 2	Isobaric
Process 3	Isochoric
Process 4	Isothermal.

Ans#

Ideal gas eqn - $pv = NRT$

Isobaric process — constant pressure
Isochoric process — constant volume
Isothermal process — constant temperature
Adiabatic process — $pv^{\gamma} = K$ (no exchange of heat or mass).

Q3(a):- Hydrogen is compressed under a constant pressure of 5760 lb/Ft² until the ~~water~~ volume is reduced from 28 to 12 Ft³. Calculate the work done in compressing gas?

Sol# DATA:

Pressure = $P = 5760\ lb/in^2$
$V_2 = 28\ ft^3$
$V_1 = 12\ ft^3$
Work done = ?

(4)

Solution :- As in constant pressure process

Work done = $P(V_2 - V_1)$

$= 5760 \times 144 (28 - 12)$

$= 5760 \times 144 (16)$

Work done = 1327 1040 ft - lb_f Answer.

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Q3b) Differeniate b/w enthalpy and entropy using example from daily life?

Ans # Differeniate b/w enthalpy and entropy using example from daily life are.

Enthalpy	Entropy
1) Enthalpy is a kind of energy	1) Entropy is a property
2) It is the sum of internal energy and flow energy	(2) it is the measurement of randomness of molecules
(3) it is denoted by symbol 'H'	(3) it is denoted by 'S'
(4) it related is applicable in standard conditions	(4) it does not have any limit or conditions
(5) The system favour minimum enthalpy	(5) The system favour maximum enthropy

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Example # In a 4 stroke diesel engine, when piston take the air into cylinder (pulls the air the into cylinder) i.e Performing the first or inlet stroke while moving from top to bottom it fully fills the cylinder with air then comes the turn of compressing this air and this compared with a 4 stroke petrol engine.

In this process Entropy is decreased i-e size of air is decreased without removing heat from the air (while Enthalpy remains same). This decrease in Entropy without decreasing enthalpy ie. without dissipating heat somewhere in the surrounding or nerby matter or environment causes a useful rise in the temperature of air about 600 degree Centigrade which is more than enough to burn the diesel sprayed at that very time.