P#1

NAME : Shafqat Hussain
Reg # : chen19111034
Subject : Thermodynamics

QNO. 1

System:- Part of universe under consideration is known as system.
e.g All The organ that work together for digestion

Surrounding:- Everything in universe except system is called surrounding

Adiabatic Process:- An Adiabatic Process is a type of thermodynamics Process which occur without transferring heat or mass between the system and its surrounding

Isolated system:- In this type of system both mass and energy cannot enter or leave the system

Shafqat Hussain P#02 Chem19111034

Extensive property:-

A property that depends on the amount of matter in a sample, mass and volume are example of extensive properties.

Q No. 2

Data:-

$P = 7 \text{ bar}$

$\hat{H} = 2600 \frac{kJ}{kg}$

$\hat{V} = ?$

$\hat{U} = ?$

Sol

$\hat{h} = h_f + x h_{fg}$

$2600 = 697.1 + x(2064.9$

$2600 - 697.1 = x(2065.9)$

$x = \frac{1902.9}{2064.9}$

$\boxed{x = 0.921}$

$\hat{V} = x v_g$

$= (0.921)(0.27281$

$\boxed{\hat{V} = 0.2512 \, m^3/kg}$

$\hat{U} = U_f + x\, U_{fg}$

$= 696.3 + (0.921)(2571.1 - 696.3)$

$= 696.3 + (0.921)(1874.8)$

$= 696.3 + 1726.908$

$\boxed{\hat{U} = 2420 \frac{KJ}{Kg}}$

Scanned with CamScanner

QNo:3

Given Data

$m = 10\ kg$

$P_1 = 20\ bar$

$V_1 = 1\ m^3$

$P_2 = 100\ bar$

$PV^{1.5} = \text{Constant}$

$$P_2 = \frac{100\ bar}{} \Big| \frac{100\ kPa}{1\ bar} \Big| \frac{1\ MPa}{1000\ kPa}$$

$P_2 = 10\ M$

$\hat{V}_2 = ?$

$P_1 \hat{V}_1^{1.5} = P_2 \hat{V}^{1.5}$

$$\hat{V}_2^{1.5} = \frac{P_1 \hat{V}_1^{1.5}}{P_2}$$

$$\hat{V}_2 = \left(\frac{P_1 \hat{V}_1^{1.5}}{P_2} \right)^{1/1.5}$$

$$\hat{V}_2 = \left[\frac{2\ MPa}{} \Big| \frac{(0.1\ m^3)^{1.5}}{(1\ kg)^{1.5}} \Big| \frac{1}{10\ MPa} \right]^{1/1.5}$$

$$\hat{V}_2 = \left(0.2 \times (0.1)^{1.5}\right)^{1/1.5} \ m^3/kg$$

$$= (0.2 \times 0.0316)^{1/1.5}$$

$$= (0.2 \times 0.0516)^{0.667}$$

$$\boxed{\hat{V}_2 = 0.034 \ \frac{m^3}{kg}}$$

$$\hat{W} = ?$$

$$\hat{W} = \int_{0.1}^{0.0342} P_E \, d\hat{V}$$

$$\hat{W} = -\int_{0.1}^{0.0342} \frac{P_1 \hat{V}_1^{1.5}}{\hat{V}^{1.5}} \, d\hat{V}$$

$$\hat{W} = 2 P_1 \hat{V}_1^{1.5} \left[\frac{1}{\hat{V}_2^{0.5}} - \frac{1}{\hat{V}_1^{0.5}} \right]_{0.1}^{0.0342}$$

$$\hat{W} = 284 \ \frac{kJ}{kg}$$

From steam table

at 2 MPa

$\hat{V}_l = 0.0012$

$\hat{V}_v = 0.0996$

steam is super heated

$T(°C)$	$\hat{V}(m^3/kg)$
212.4	0.0996
T	0.1
225	0.1038

$$y\left[(y_2 - y_1)\left(\frac{x - x_1}{x_2 - x_1}\right)\right] + y_1$$

$$T = 225 - 212.4\left(\frac{0.1 - 0.0996}{0.1038 - 0.0996}\right) + 212.4$$

$T = 213.6C$

$\Delta\hat{U} = \hat{U}_2 - \hat{U}_1$

$q = ?$

$\Delta \hat{U} = q + \hat{W}$

$\Delta \hat{U} = ?$

At state 1

$P_1 = 2 MPa, \ T_1 = 213.6 C$

$U_1 \left(\frac{KJ}{Kg}\right)$	$T(C)$
	212
2600.3	213.6
U_1	
2628.3	225

$U_1 = 2602.97 \ \frac{KJ}{Kg}$

At state → 2

$P_2 = 1.2 MPa, \ \hat{V}_2 = 0.0342 \ \frac{m^3}{Kg}$

$U_2 (KJ/Kg)$	$\hat{V}_2 (m^3/Kg)$
	0.8328
3.04	0.0342
$\hat{U}_2$	
3144.5	0.0356

PH 18

$= (3098.15 - 2601.97) \frac{kJ}{kg}$

$\Delta\hat{U} = (492.18\ kJ/kg)$

$\Delta\hat{U} = \hat{Q} + \hat{W}$

$\hat{Q} = \Delta U - \hat{W}$

$\hat{Q} = 492.18 - 283.8 \frac{kJ}{kg}$

$\hat{Q} = 208.38\ kJ/kg$