Code No: NR220802 **NR**

II B.Tech II Semester Supplementary Examinations, Apr/May 2006
CHEMICAL ENGINEERING THERMODYNAMICS-I
(Chemical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Define the term Thermodynamics. What are its applications?
   (b) State the study of Thermodynamics with the view point of microscopic and macroscopic approach. [8+8]

2. Explain joules experiment in detail. What did he conclude from it? [16]

3. Explain briefly the following:
   (a) Dalton's law of partial pressures. [4]
   (b) Internal energy, enthalpy and specific heat of gas mixtures. [6]
   (c) Entropy of gas mixtures. [6]

4. Ethylene is compressed isothermally from 10 bar and 300 K to 750 bar. Calculate the changes in specific internal energy, specific enthalpy and specific entropy using the compressibility chart. [16]

5. 1.5 kg/mt of hot gas enters a heat exchanger at 225^0C and leaves at 125^0C. Water at 0.75 kg/s enters this exchanger at 60^0C counter currently. Comment on the reversibility of the process and calculate the total availability which is lost if $T_0 = 25^0$C. Specific heat of gas is 1.25 KJ/kg^0C. [16]

6. A metal block of specific heat 0.09Kcal/kg^0C and mass of 10kg is initially at 50^0C.
   (a) 2 kg of water at 35^0C is used to quench the block, what is the total entropy change?
   (b) Repeat if 2 kg of water at 15^0C is used. Comment on the above process. [8+8]

7. A process stream is heated as a gas from 25^0C to 250^0C at constant pressure. A quick estimate of the energy requirement is obtained., with C_p taken as constant and equal to its value at 25^0C. Is the estimet of Q likely to be low or high? Why? [16]

8. Methane is burned with 20% excess air, both methane and air being at 298K. The standard heat of combustion of methane at 298K is (-802.625) kJ. The heat capacities (J/mol.K) are $C_P = a + bt + cT^2$

	a	b*10^3	$c * 10^6$
C_p (CH_4)	14.15	75.499	-17.9915
$C_p(O_2)$	30.255	4.207	-1.8873
C_p (N_2)	27.27	4.930	3.3256
$C_p(CO_2)$	45.369	8.688	9.6193
$C_p(H_2O)$	28.850	12.055	1.006

calculate the adiabatic flame temperature attained. [16]

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