

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Mid Semester Examination – March 2019

Course: B. Tech in chemical engineering

Sem: IV

Subject Name: chemical engineering thermodynamics-I

Subject Code: BTCHC402

Max Marks: 20

Date:-12/03/2019

Duration:- 1 Hr.

Instructions to the Students:

1. Question 1 is compulsory and carries 6 marks
2. Solve any two from question 2 and solve any one question from question 3.
3. Figures to right indicate marks
4. If any data is missing, you may assume it and mention it in your answer sheet. Usual symbols apply

		(Level/CO)	Marks
Q. 1	Pick the correct alternative for the following question		6
	1. All spontaneous processes are a. Reversible b. Irreversible c. Reversible adiabatic d. adiabatic	understanding	
	2. ideal gas law is applicable at a. Low T and low P b. high T and high P. c. Low T and high P. d. high T and low P	understanding	
	3. assuming that CO ₂ obeys the perfect gas law, the density of CO ₂ in kg/m ³ at 536 K and 202.2 kPa is. a. 1 b. 2 c. 3 d. 4	applying	
	4. the kinetic energy of gas molecule is zero at a. 0°C b. 273 °C c. 100 °C d. -273 °C	applying	
	5. Maximum work that could be secured by expanding the gas over a given pressure range is the _____ work. a. isothermal b. adiabatic c. isentropic d. none of these	understanding	
	6. Isobaric process means a constant process a. temperature b. pressure c. volume d. entropy	understanding	
Q.2	Solve Any Two of the following.		3 X 2
(A)	State and explain first law of thermodynamics for open system.	understanding	
(B)	Calculate change in internal energy and change in enthalpy in KJ for 1 kmol water, as it is vaporized at constant temperature of 373K and constant pressure of 101.3kPa. the specific volume of liquid and vapour at these conditions are 1.04×10^{-3} and $1.675 \text{ m}^3/\text{kmol}$ respectively: 1030 kJ of heat added to water for this change.	Analyzing	
(C)	An electric current of 0.5 A from a 12 V supply is passed for 5 minutes through a resistance in thermal contact with saturated water at 1 atm. As a result, 1.798 g of water is vaporized. Assume that water vapour behaves ideally, calculate the molar internal energy change and enthalpy change during	Analyzing	

	process.		
			8
Q. 3	Solve Any One of the following.	applying	
(A)	Steam at 1800 kPa and 673.15 K steadily enters a nozzle at a rate of 5 kg/s and leaves the nozzle at 1400 kPa with a velocity of 300 m/s. the inlet area of the nozzle is 0.02 m ² . heat losses from the nozzle per unit mass are estimated to be 3.3 kJ/kg. Determine the exit temperature.		
(B)	An ideal gas is undergoing a series of three operations: the gas is heated at constant volume from 300 K and 1 bar to pressure of 2 bar. It is expanded in reversible adiabatic process of 1 bar. It is cooled at constant pressure of 1 bar to 300 K. determine heat and work effect for each step. Assume $C_p = 29.3$ kJ/kmol K	Analyzing	
	*** End ***		

Answer of