

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-V (OLD) - EXAMINATION – SUMMER 2017

Subject Code: 150503

Date: 01/05/2017

Subject Name: Chemical Engineering Thermodynamics-II

Time: 02:30 PM to 05:00 PM

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Draw neat sketches wherever required.

- Q.1** (a) What is partial molar quantity? Discuss its physical significance and importance. 07
 (b) Prove that $\Delta G^0 = -RT \ln K$ 07

- Q.2** (a) Write in brief on various methods of evaluating the equilibrium constant. 07
 (b) Prepare a block diagram for BUBLT and DEWT for systems following Raoult's law. 07

OR

- (b) Write a brief note on Ideal and non ideal solutions 07
Q.3 (a) Write in brief on the effect of temperature on equilibrium constant 07
 (b) Discuss the statement "Raoult's law is applicable to the solvent when Henry's law to the solute". 07

OR

- Q.3** (a) Assuming Raoult's law to be valid, prepare a P - xy diagram for a temperature of 100°C for the following systems of Benzene(1)/ Ethyl benzene(2) using the Antoine equation. 07

$$\ln P^{\text{sat}} = A - [B \div (t + C)] \text{ where } P^{\text{sat}} \text{ is in kPa and } t \text{ is in } ^\circ\text{C}$$

Component	A	B	C
Benzene	13.86	2,774	220.1
Ethyl benzene	14.00	3,279	213.20

- (b) For a binary system, if the activity coefficient for component '1' is $\ln \gamma_1 = \beta x_2^2$, then derive the expression for component '2'. 07
Q.4 (a) Write a brief note on retrograde condensation. 07
 (b) Derive the equation for the criteria for phase equilibria in terms of fugacity for a mixture of N components and π phases. 07

OR

- Q.4** (a) The enthalpy of a binary liquid mixture of species 1 and 2 at fixed T and P is represented by the equation: $H = 400 x_1 + 600 x_2 + x_1 x_2 (40 x_1 + 20 x_2)$ 07
 Where H is in J mol⁻¹. Calculate values of $H_1, H_2, \bar{H}_1^\infty, \bar{H}_2^\infty$.
 (b) Outline the method to determine P-T Flash calculations 07

- Q.5** (a) Carry out thermodynamic analysis of any one important industrial reaction 07
 (b) Write a brief note on Van't Hoff Equilibrium box 07

OR

- Q.5** (a) How is equilibrium conversion evaluation for heterogeneous system? 07
 (b) Write short note on the Langrange method of undetermined multiple used for multiple reaction equilibrium. 07
