Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI • EXAMINATION – SUMMER 2013

Subject Code: 160501 **Date: 24-05-2013**

Subject Name: Mass Transfer Operations -II

Time: 10.30 am - 01.00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Discuss differential distillation and derive Rayleigh equation for a binary mixture. **07**

(b) What is azeotrope? Discuss positive deviations from ideality with examples and neat sketch. **07**

Q.2 **(a)** Discuss:1) Total reflux 2) Minimum reflux ratio **07**

(b) Derive equation for q line. **OR** **07**

(b) Discuss location of feed tray in detail. **07**

Q.3 **(a)** A liquid containing 50 mol% benzene(A), 25 mol% toluene(B), and 25 mol % o-xylene (C) is flash vaporized at1 std atm pressure and 100 ^{0}C. Compute the amounts of liquid and vapor products and their composition. Vapour pressures of components, in mm Hg are given as below: **07**

Benzene = 1370, Toluene = 550, o-xylene = 200

(b) Discuss ideal solutions and Roultôs law. **07**

OR

Q.3 **(a)** For a vapour -gas mixture, discuss 1) Relative saturation 2)Enthalpy 3) wet bulb temperature 4) Humid volume **07**

(b) Discuss various types of cooling towers with neat sketch. **07**

Q.4 **(a)** Discuss types of adsorption and nature of adsorbents in detail . **07**

(b) Discuss adsorption hysteresis and effect of temperature on adsorption. **07**

OR

Q.4 **(a)** Explain principles of ion exchange. Discuss techniques and application of ion exchange. **07**

Q.4 **(b)** A gas (B) ï benzene (A) mixture is saturated at 1 std atm, 50^{0}C. Calculate the absolute humidity if B is (a) nitrogen and (b) carbon dioxide. **07**

Data Given: Vapor pressure of nitrogen at 50^{0}C = 0.362 std atm

Q.5 **(a)** Define and explain followings: 1) Equilibrium moisture 2) Bound moisture 3) Unbound moisture 4) Free moisture **07**

(b) Discuss different types of direct driers in brief. **07**

OR

Q.5 A batch of solid for which the material is dried from 25 to 10% moisture has the initial weight of solid to be 160 kg. The drying surface is 1 m^2/40 kg dry weight. Determine the time of drying for constant rate period and falling rate period using graphical method. The data are as follows: **14**

X	0.35	0.3	0.25	0.2	0.16	0.14	0.12	0.1	0.09
N	0.3	0.3	0.3	0.3	0.239	0.208	0.18	0.15	0.097

Where X= kg moisture / kg dry solid

N= rate of drying x 10^3 , kg evaporated /m^{2-}sec.