

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 at 1 std atm pressure and 100 °C. Compute the amounts of liquid and vapor products and their composition. Vapour pressures of components, in mm Hg are given as below:
 Benzene = 1370, Toluene = 550, o-xylene = 200 **07**
 (b) Discuss ideal solutions and Raoult's 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) in benzene (A) mixture is saturated at 1 std atm, 50°C. Calculate the absolute humidity if B is (a) nitrogen and (b) carbon dioxide. **07**
 Data Given: Vapor pressure of nitrogen at 50°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 m²/40 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 10³, kg evaporated /m²-sec.