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Paper Code: CH-601	**Roll No.**									

B. TECH.

SIXTH SEMESTER EXAMINATION, 2015-2016

MASS TRANSFER-II

Time: 3 Hours ***Total Marks: 100***

(Note: attempt all questions. All questions carry equal marks. Assume suitable data, if missing)

1. Attempt any four parts of the followings. All parts carry equal marks. **(5x4 =20)**
   a. What do you mean by relative volatility? discuss its significance in distillation
   b. Define Raoult's law. Discuss its applications.
   c. What are different kind of distillations? Explain any one of them in brief.
   d. Explain, how the enthalpy-concentration diagram and x-y diagram are related.
   e. What are maximum boiling azeotropes? Discuss with neat graph.
   f. Differentiate between atmospheric and vacuum distillation with suitable examples.

2. Attempt any two parts of the followings. All parts carry equal marks. **(10x2=20)**
   a. Derive the equation of feed line in McCabe Thiele method and draw a diagram to show the effect of feed conditions on feed line.
   b. Write short notes on the followings
      (i) Optimum reflux
      (ii) Total reflux ratio
      (iii) Tray efficiency
      (iv) Use of open steam
      (v)
   c. A mixture of benzene and toluene containing 40 mole percent of benzene is to be separated to give a product of 90 mole percent of benzene at top and a bottom product with not more than 10 mole percent benzene. Using an average value of 2.4 for the volatility of benzene relative to toluene, calculate the number of theoretical plates required at total reflux. Also calculate the minimum reflux ratio, if the feed is liquid at its boiling point.

3. Attempt any two parts of the followings.All parts carry equal marks. **(10x2=20)**

   a. (i) Describe the process of super critical fluid extraction in brief.
      (ii) Discuss the construction and working of batch operated mixer-settler for extraction.

   b. List the situations where the liquid-liquid extraction might be preferred to distillation and distinguish for ternary mixture between Type-I and II systems.

   c. A nicotine-water solution of 150 kg containing 1% nicotine is to be extracted with 250kg of kerosene at 20^0C. Water and kerosene are essentially immiscible in each other. Determine the percentage extraction of nicotine after one stage operation. At the dilute end of the system, the equilibrium relationship is Y*=0.798 X, where Y and X are expressed as kg nicotine/kg kerosene and kg nicotine /kg water respectively.

4. Attempt any two parts of the followings. All parts carry equal marks. **(10x2=20)**

a. Describe the equipment used for batch and continuous leaching with their suitable diagrams. Also write the advantages and problem of carrying out extraction of a solid at an elevated temperature.
b. Draw and explain the different types of equilibrium curve which may be encountered in leaching.
c. Vegetable oil seeds containing 100 gm insoluble solid and 10 gm oil are contacted with 200gm of organic solvent in a single stage leaching operation. The solvent used is fresh. Determine the amount of oil left in the oil seeds after the leaching. The equilibrium data can be expressed as:

$$N = -4y+8$$

where, N= gm insoluble/(gm solvent + gm oil) and
y = gm oil/(gm solvent + gm oil); in seed phase
x = gm oil/(gm solvent + gm oil) ; in solvent phase

The tie line data are

y	0.26	0.28	0.31	0.34
x	0.02	0.04	0.06	0.08

5. Write short notes on ***any four*** of the followings **(5x4 =20)**

a. Ponchon Savarit method
b. Sweep diffusion
c. Thermal diffusion
d. Reverse osmosis
e. Principles of dialysis and its applications
f. Physical adsorption and chemisorptions