Printed Pages : 4

ECH601

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 151601

Roll No.

B.Tech

(SEM. VI) THEORY EXAMINATION 2014-15

MASS TRANSFER OPERATIONS-II

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

Note: Attempt **all** the questions. In case of numerical problems assume data wherever not provided. All questions carry equal marks.

1 Attempt any **four** parts of the following: **5×4=20**

(a) What do you mean by relative volatility ? Discuss its significance in distillation.

(b) Discuss molecular distillation with diagram.

(c) Define the Raoult's Law. Discuss its applications.

(d) Explain, how the enthalpy-concentration diagram and x-y diagram are related?

(e) Differentiate between flash vaporization and differential distillation.

(f) Explain azeotropic distillation with diagram.

2 Attempt any **Two** parts of the following: **10×2=20**

(a) In a rectification column we get the distillate at a rate of 80 kg mole/hr., containing 95% A. in this rectifying section the composition data collected on some plate and a adjacent one is as follows

X	0.68	0.49
Y	0.88	0.72

Assuming equal latent heat of vaporization of the mixture components (A+B), with a saturated liquid feed, find the reflux ratio and vapour flow rate in the stripping section.

(b) A mixture of benzene and toluene containing 44 mole% benzene is fractionated in a tray column to get about 95 mole% benzene in the distillate and 8 mole% benzene in bottoms. If feed is a mixture of 1/3rd vapours and reflux ration of 1.5 times the minimum is used with a constant relative volatility of 2.5, find the number of ideal trays required.

(c) A binary liquid (A+B) stream containing 55% of A (more volatile component) enters a heater and then to a flash drum where 38% of the feed is flash vaporized. Calculate the compositions of outlet streams at equilibrium conditions if relative volatility of the mixture is 1.8.

3 Attempt any **Two** parts of the following: **10×2=20**

(a) (i) Explain in brief the construction and working of batch operated mixer-settler for extractor.

(ii) Discuss the process of super critical fluid extraction in brief.

(b) List situation where liquid–liquid extraction might be preferred to distillation and distinguish, for ternary mixtures between Type I and II systems.

(c) Explain Distribution Coefficient and Derive the expression for the multistage cross current liquid-liquid extraction.

4 Attempt any **Two** parts of the following: **10×2=20**

(a) Define leaching. Discuss the role of solids feed preparation in leaching. Discuss the important application of leaching in chemical and allied industries.

(b) Oil is to be extracted from meal by means of benzene using a continuous counter current extractor. The unit is to treat 1000Kg of meal (based on completely exhausted solid) per hour. The untreated meal contains 400Kg of oil and is contaminated with 25Kg of benzene. The fresh solvent mixture contains 10Kg of oil 655 Kg of benzene. The exhausted solid are to contain 60Kg of unextracted oil. Experiments show that the solution retained depends on the concentration of the solution as shown in table:-

Concentration Kg oil/Kg Solution	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7
Solution Retained Kg/Kg Solod	0.500	0.505	0.515	0.530	0.550	0.571	0.595	0.620

Find (i) mass of solution leaving with the extracted meal (ii) number of stages required.

All quantities are given on an hourly basis.

(c) Draw and explain the different types of equilibrium curve which may be encounter in leaching.

5 Attempt any **Two** parts of the following: **10×2=20**

(a) For adsorption from dilute liquid solutions in stage wise counter current operations, where the Freundlich equation describes the adsorption equilibrium, derive analytical expression for the minimum adsorbent/solvent ration when fresh adsorbent is used.

(b) Write the short notes on Adsorption hysteresis and Effect of temperature and pressure on adsorption operation.

(c) Derive the expression for the multistage crosscurrent adsorption.