Reg. No.

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

V SEMESTER B.Tech. (CHEMICAL ENGINEERING)

MAKEUP EXAMINATIONS, Dec 2017

SUBJECT: MASS TRANSFER-II [CHE 3101]

REVISED CREDIT SYSTEM (23/12/2017)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates: Answer ALL the questions. Missing data may be suitably assumed.

1A. A Liquid mixture containing 30 mole% of A (more volatile) at 30^0 C is to be flash vaporized at 1 atm to vaporize 70% moles of the feed. The x-y data given below

x	0	0.00	0.01	0.02	0.0891	0.14	0.28	0.37	0.477	0.61	0.64	0.7	0.78	0.89
y	0	0.085	0.15	0.19	0.427	0.49	0.56	0.60	0.644	0.70	0.72	0.75	0.8	0.89

Calculate the composition of the distillate and residue — 5

1B. Derive the following equation for Differential Distillation of constant relative volatility system $\log\frac{Fx_F}{Wx_W} = \alpha\, log\left(\frac{F(1-x_F)}{W(1-x_W)}\right)$ where F and W are feed and residue moles and x_F, x_W are feed and residue mole fractions and α is relative volatility — 5

2A P (z_p, H_p) moles formed when M (z_m, H_m) moles and N(z_n, H_n) moles of solutions adiabatically mixed. Prove the straight line MN pass through point P on H-x,y diagram. — 3

2B Derive the 'q' line equation for $y = \frac{q}{q-1}x - \frac{z_F}{q-1}$ the method McCabe and Thiele method in distillation — 7

3A Calculate the bubble point of given system at 1.5 atm. Log (P) = A – {B/(T+C)} P is mm Hg and T is °C

component	Mole fraction	A	B	C
1	0.4	6.87632	1075.78	233.205
2	0.6	6.91058	1189.64	226.28

— 5

3B Briefly explain the re-boilers used in distillation with neat diagram (atleast 2) — 2

3C With the help neat diagram explain the hysteresis phenomena in drying — 2

Define osmotic pressure? — 1

4A Explain the below four important properties required for a good solvent in LLE

i)Selectivity ii) Distribution coefficient iii) recoverability iv) insolubility of solvent — 3

4B Dioxane (20%) in Water (80%) solution is to be separated/extracted using pure Benzene as solvent to remove 95% of the Dioxane from the 200 kg of solution. Benzene and Water are essentially insoluble. If the extraction was done in two stages find the amount of dioxane — 7

extracted with the following condition. Solvent used was, first stage equal amount of water and in second stage half of the water. The equilibrium data is given below

	Wt% of Dioxane in water	5.1	18.9	25.2
	Wt% of Dioxane in Benzene	5.2	22.5	32

5A	Briefly explain in-place leaching, heap leaching, Shanks system used in leaching	4
5B	Isotonic saline solution, which has the same osmotic pressure as blood, can be prepared by dissolving 0.923 grams of NaCl in enough water to produce 300 mL of solution. What is the osmotic pressure, in atmospheres of this solution at 35°?	3
5C	Define the following i) moisture content wet and dry basis ii) equilibrium moisture content	3

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