Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

V SEMESTER B.Tech. (CHEMICAL ENGINEERING)

END SEMESTER EXAMINATIONS, NOV 2017

SUBJECT: MASS TRANSFER-II [CHE 3101]

REVISED CREDIT SYSTEM (20/11/2017)

Time: 3 Hours MAX. MARKS: 50

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

1A. A mixture of 50% Benzene, 25% Toluene and 25% p-Xylene is differentially distilled at 1 atm with a vaporization of 32.5 mole% of charge. Raoults law applies. Calculate the residual liquid and composite distillate. Saturated vapor pressures of Benzene, Toluene and p-Xylene is 1370, 550, 200 mm Hg respectively. **7**

1B. Prove that $-\frac{A}{B_n} = \frac{y'_S - y'_n}{x'_{n-1} - x'_n}$ with complete nomenclature and flow sheet for the case of insoluble liquids (LLE) **3**

2 A dilute aq. solution of Ethanol is to be concentrated from 30% to 80% in a tray tower at atmospheric pressure. The feed rate is 200 Kmoles/hr with an enthalpy of 20000 kJ/kmol. The bottom product must not contain more than 3.5 % Ethanol (all are in mole %). Determine Minimum reflux ratio. Obtain the theoretical stages and calculate the condenser and reboiler heat loads at 1.5 times of minimum reflux ratio. H_{G1}=45000 kJ/kmol; H_{L0}=H_D= 8900 kJ/kmol; H_W=8450 kJ/kmol

X	0	0.016	0.020	0.0891	0.143	0.281	0.477	0.7	0.89
Y	0	0.158	0.191	0.427	0.493	0.568	0.644	0.756	0.89

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3 If 100 kg of solution Pyridine (C) and water (A) containing 30% of 'C' is to be extracted with Chlorobenzene (B) in two stages at 20 °C, using 30 kg of solvent in each stage. Determine the quantities and compositions of the various streams. How much solvent would you required if the same final raffinate concentration were to be obtained with one stage.

Pyridine (wt%)	Chloro-benzene (wt%)	Water (wt%)	s.no.	Pyridine (wt%)	Chloro-benzene (wt%)	Water (wt%)
0	99.95	0.05	1	0	0.08	99.92
11.05	88.28	0.67	2	5.02	0.16	94.82
18.95	79.9	1.15	3	11.05	0.24	88.71
24.1	74.28	1.62	4	18.9	0.38	80.72
31.55	65.58	2.87	5	36.1	1.85	62.05
40.6	53	6.4	6	53.2	8.9	37.9
49	37.8	13.2	7	49	37.8	13.2

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4A. Briefly explain azeotropic and extractive distillation with the help of neat diagram and example **4**

4B.	A solution is prepared by dissolving 35.0 g of hemoglobin in enough water to make up 1.00 L in volume. The osmotic pressure of the solution is found to be 10 mmHg at 25.0 °C. Calculate the molar mass of hemoglobin	**3**
	Explain the types of modules used in membrane separations? (atleast three)	**3**
5A.	Explain various types of equilibrium diagrams encounter in Leaching with diagram	**3**
5B.	Define bound, unbound and free moisture	**2**
	With the help of graph explain the drying phenomena for $CuSO_4$ solution	**2**
5C.	Give the component and complete balance in Leaching for single stage (all three components)	**3**

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