Reg. No.



**ANIPAL** A Constituent Institution of Manipal University

## V SEMESTER B.TECH. (CHEMICAL ENGINEERING)

### **MAKEUP EXAMINATIONS, JAN 2017**

# SUBJECT: MASS TRANSFER-II [CHE 3101]

### **REVISED CREDIT SYSTEM**

Time: 3 Hours

MAX. MARKS: 100

### **Instructions to Candidates:**

Answer **FIVE FULL** questions.

Missing data may be suitable assumed.

1A.	100 kmol/hr of feed having 65 mole % of benzene (A) and toluene (B) is differentially distilled at 1 atm with 70% mole % of liquid distilled. Compute the composition of the compounded distillate and the residue. $\alpha$ is constant at 2.2;								
1B.	Identify the boiling point of the following solution which contains benzaldehyde and water (steam distillation) at 1 atm. $log_{10}(P) = A - (B / (T + C))$ $P = Pressure (bar)$ $T = temperature (K)$								
		Benzaldehyde water	5.21496   4.6543	2337.539 1435.264	-5.103 -64.84	3			
1C.	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.								
2.	A solution contains 20% of n –Pentane, is to be concentrated to 80% in a tray towerThe feed is entering the distillation column with 30% liquid at a rate of 8000 kg/hr.The other component, n Heptane, concentration has to be 95% in bottoms. Obtaingraphically the number of theoretical stages required with twice the minimum refluxratio. (all percentages are in mass %, Pentane M.W.= 72, Heptane MW =100)Equilibrium data of n pentane and n heptane is given below $\mathbf{x}$ 000.0590.1450.2540.3980.5940.8671 $\mathbf{y}^*$ 00.2710.5210.7010.8360.9250.984							20	
3A.	Give the component and material balance for absorption section with heat losses								
3B.	Briefly explain atleast four used in distillation column setup								
3C.	Derive the q- line equation in McCabe Thiele method								
4A	Explain briefly about the reverse osmosis								
4B	Isotonic saline solution, which has the same osomotic pressure as blood, can be prepared by dissolving 0.923 grams of NaCl in enough water to produce 100.0 mL of solution. What is the osmotic pressure, in atmospheres of this solution at 25°Celsius?								
4C	Explain the following processes which are used in leaching process i) Shanks system ii) Heap leaching iii) Percolation tank and Agitation vessels								

	If 100 kg's of solution Pyridine (C), Chlorobenzene (B) and water (A) containing $30\%$ of 'C' is to be extracted with three times with B at $20^0$ C, using 30 kg of solvent in each stage, determine the quantities and compositions of the various streams. How much solvent would be required if the same final raffinate concentration were to be obtained with one stage. ( <b>Rectangular coordinates</b> )								
5	Pyridine	Chloro-benzene	Water		Pyridine	Chloro-benzene	water		
	0	99.95	0.05		0	0.08	99.92		20
	11.05	88.28	0.67		5.02	0.16	94.82		
	24.1	74.28	1.62		18.9	0.38	80.72		
	28.6	69.15	2.25		25.5	0.58	73.92		
	35.05	61	3.95		44.95	4.18	50.87		
	40.6	53	6.4		53.2	8.9	37.9		
	49	37.8	13.2		49	37.8	13.2		
6A	Explain the equilibrium diagrams encountered in Liquid-Liquid extraction								9
6B	Explain the equilibrium diagrams encountered in Leaching								9
6C	State Roults law and its mathematical expression								