Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V • EXAMINATION – SUMMER • 2014

Subject Code: 153502 **Date: 13-06-2014**

Subject Name: Basics of Mass Transfer

Time: 10:30 pm to 01:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	State dimensions and SI units of diffusivity, concentration gradient, and molar flux. Convert 1 cm^2/s, 1 (mol/l)/ (cm), and 1 mol/cm^2 s to corresponding SI units.	**07**
	(b)	Starting from Fick's law of diffusion, derive an integrated equation to compute the molar flux of gas A diffusing through non-diffusing gas B. A and B are ideal gases.	**07**
Q.2	**(a)**	Explain wet bulb temperature and adiabatic saturation temperature.	**07**
	(b)	When is the operation liquid extraction used in chemical process industry? Explain binodal solubility curve taking suitable example of a ternary system.	**07**
		OR	
	(b)	What are various factors influencing the rate of leaching? Describe their effect on leaching process. Explain the terms overflow and underflow.	**07**
Q.3	**(a)**	Compare and contrast horizontal tube and vertical tube natural circulation evaporators.	**07**
	(b)	What are MVC and LVC in distillation? On what principle is distillation operation based? How is equilibrium data expressed in distillation?	**07**
		OR	
Q.3	**(a)**	Draw a neat schematic diagram of forward feed triple effect evaporator?	**07**
	(b)	Define the term relative volatility (α) and hence derive the following equation for a binary system $$y = \frac{\alpha x_A}{1 + (\alpha - 1)x_A}$$	**07**
Q.4	**(a)**	Derive a relation between individual and overall mass transfer coefficients according to two film theory.	**07**
	(b)	Describe fractional distillation with the help of a neat diagram. What is reflux ratio?	**07**
		OR	
Q.4	**(a)**	Show on a drying curve free, critical, and equilibrium moisture contents of a solid?	**07**
	(b)	Describe with a schematic diagram circulating-magma vacuum crystallizer.	**07**
Q.5	**(a)**	Draw a schematic diagram of tray type gas absorption column and describe the process.	**07**
	(b)	Describe with a schematic diagram circulating-liquid evaporator crystallizer.	**07**
		OR	
Q.5	**(a)**	What are the advantages of membrane separation processes? Give any three membrane separation processes and mention their driving forces.	**07**
	(b)	Draw a schematic diagram of packed bed gas absorption column and described the process.	

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