Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– V EXAMINATION – SUMMER 2020

Subject Code: 2150501 **Date:27/10/2020**

Subject Name: MASS TRANSFER OPERATION - I

Time: 02:30 PM TO 05:00 PM **Total Marks: 70**

Instructions:

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

			MARKS
Q.1	**(a)**	Define molecular diffusion and eddy diffusion with examples.	**03**
	(b)	Differentiate between Direct and Indirect Mass transfer operations.	**04**
	(c)	State different theories explaining the meaning of mass transfer coefficients. Explain any one in detail.	**07**
Q.2	**(a)**	Explain temperature and pressure dependency of diffusivity of gases.	**03**
	(b)	Explain the concept of equilibrium in case of interphase mass transfer.	**04**
	(c)	State Fick's first law of diffusion and explain N_A and J_A. Also, prove that for unidirectional binary diffusion $J_A = - J_B$.	**07**
		OR	
	(c)	In an $O_2 - N_2$ gas mixture at 1 atm pressure and 25^0C, the concentration of Oxygen at two planes 2 mm apart are 10 and 20 volume % respectively. Calculate flux of diffusion of O_2 for the case where N_2 is non-diffusing. $D_{O_2-N_2} = 2.065 \times 10^{-5}$ m^2/s.	**07**
Q.3	**(a)**	What are different equipments used for gas-liquid mass transfer operations?	**03**
	(b)	What is ideal liquid solution? Mention its characteristics.	**04**
	(c)	Explain stepwise procedure to find the minimum liquid gas ratio for gas absorber with neat sketch.	**07**
		OR	
Q.3	**(a)**	Mention different types of packings used in packed tower.	**03**
	(b)	What is absorption factor A in case of gas absorption?	**04**
	(c)	Explain the selection criteria for choice of solvent for gas absorption.	**07**
Q.4	**(a)**	Mention various industrial liquid extraction equipments.	**03**
	(b)	Write a note on Caking of crystals.	**04**
	(c)	Define the following terms: Tray efficiency, murphree efficiency, coning, Weeping, Dumping, flooding, entrainment	**07**
		OR	
Q.4	**(a)**	Define: Liquid extraction, Extract, Raffinate	**03**
	(b)	Describe fundamentals of crystallization in brief.	**04**
	(c)	Differentiate between packed tower and tray tower.	**07**
Q.5	**(a)**	What are industrial applications of liquid extraction?	**03**
	(b)	List out various factors to be considered in making choice of solvent for liquid-liquid extraction.	**04**
	(c)	Explain counter current multiple contact Shanks system for leaching with neat sketch.	**07**
		OR	
Q.5	**(a)**	What is rate of leaching? Explain..	**03**

(b)	Discuss the preparation of solids in leaching.	**04**
(c)	Discuss the system of three liquids – one pair partially soluble on ternary Equilibria for liquid extraction.	**07**

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