Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (OLD) - EXAMINATION – SUMMER 2017

Subject Code: 150501 **Date: 10/05/2017**

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.**

Q.1	**(a)**	Define molecular and eddy diffusivity. Explain Fick's First law and concept of N & J Flux.	**07**
	(b)	Explain molecular diffusion of gases and diffusivity of gases.	**07**
Q.2	**(a)**	Discuss in detail about Surface Renewal theory.	**07**
	(b)	Discuss about Heat, Mass and Momentum transfer analogies.	**07**
		OR	
	(b)	How the solvent is selected for gas-liquid absorption?	**07**
Q.3	**(a)**	Discuss the concept of HETP and HTU & NTU. How the height of absorption column is determined?	**07**
	(b)	Explain about ternary equilibrium diagram and tie line data. How plait point is found out?	**07**
		OR	
Q.3		If 1000 kg/hr of a nicotine (C) - water (A) solution containing 1% nicotine is to be counter-currently extracted with kerosene at 20^0 C to reduce the nicotine content to 0.1%, determine (a) the minimum kerosene rate and (b) the number of theoretical stages required if 1150 kg of kerosene is used per hour.	**14**

The equilibrium data are as follows:

X'	0	0.001011	0.00246	0.00502	0.00751	0.00998	0.0204
Y'	0	0.000807	0.001961	0.00456	0.00686	0.00913	0.0187

where,

X' = kg nicotine/kg water

Y' = kg nicotine/kg kerosene

Q.4	**(a)**	Explain continuous counter current extraction with reflux.	**07**
	(b)	Discuss the difference between Tray tower v/s Packed tower.	**07**
		OR	
Q.4	**(a)**	With a neat sketch explain the working of the Shanks system.	**07**
	(b)	Explain the material balance of single stage leaching.	**07**
Q.5	**(a)**	With a neat sketch explain the working of Ballman Extractor.	**07**
	(b)	Define crystallization? Discuss the theory and principle of crystallization.	**07**
		OR	
Q.5	**(a)**	Sketch various types of packings and their selection criteria.	**07**
	(b)	Discuss about flooding and loading and channeling for a packed tower.	**07**

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