# **GUJARAT TECHNOLOGICAL UNIVERSITY BE - SEMESTER-V • EXAMINATION - SUMMER • 2014**

Subject Code: 150501

## Date: 11-06-2014

Subject Name: Mass Transfer Operation - I Time: 10.30 am - 01.00 pm

## **Total Marks: 70**

07

07

07

07

### **Instructions:**

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

Q.1	(a)	) Discuss in detail classification of mass transfer operations and explain with exampl	
	<b>(b)</b>	Explain selection criteria for choice of solvent for liquid extraction.	07

- Q.2 Discuss in detail about Film theory for mass transfer coefficient. (a)
  - Explain molecular diffusion in gases in detail. Also discuss steady state diffusion **(b)** of A through non diffusing B.

#### OR

- (b) Discuss about various packing materials used in Column.
- 0.3 Explain selection criteria for choice of solvent for absorption. **(a)** 
  - For given liquid flow rate give stepwise procedure to determine minimum liquid **(b)** 07 gas ratio for absorbers.

#### OR

- Q.3 A counter-current plate absorber is to be installed for scrubbing of an air mixture 14 containing 5 % ammonia by volume. The scrubber is fed with water containing 0.002 mole ammonia per mole of water. The scrubbing water flows at the rate of 1 mole water per mole of air. It is required to absorb 85% of ammonia present in the gas operating absorber at 20 ° C. The equilibrium relation is given as y = 0.80 x. Calculate 1) concentration of ammonia in the outgoing liquid 2) number of stages necessary for this operation.
- Explain with a neat sketch the material balance for multi-stage liquid-liquid extraction. 07 **O.4 (a)** Define liquid extraction giving suitable example. Explain equilateral - triangular co-07 **(b)** ordinate and the mixture rule.

#### OR

If 1000 kg/h of a nicotine (C)-water (A) solution containing 1% nicotine is to be **Q.4** 14 counter currently extracted with kerosene at 200 C to reduce the nicotine content to 0.1%, determine (a) the minimum kerosene rate and (b) the number of theoretical stage required if 1150 kg of kerosene is used per hour.

Sr no	X'	y'	Sr no	X'	y'
1	0	0	5	0.00751	0.00686
2	0.001011	0.000807	6	0.00988	0.00913
3	0.00246	0.001961	7	0.0204	0.01870
4	0.00502	0.00456			

x' :kg nicotine/ kg water

y': kg nicotine/ kg kerosene

Water and kerosene are essentially insoluble.

Q.5	<b>(a)</b>	) Differentiate between Packed Tower and Tray Tower.	
	<b>(b)</b>	Write short note on Bollman extractor.	07
		OR	

- (a) Discuss preparation of the solids for leaching in detail Q.5
  - (b) Explain counter current multiple contact, Shanks system for leaching.

#### \*\*\*\*\*

07

07