

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****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 examples. **07**
 (b) Explain selection criteria for choice of solvent for liquid extraction. **07**

- Q.2** (a) Discuss in detail about Film theory for mass transfer coefficient. **07**
 (b) Explain molecular diffusion in gases in detail. Also discuss steady state diffusion of A through non diffusing B. **07**

OR

- (b) Discuss about various packing materials used in Column. **07**
- Q.3** (a) Explain selection criteria for choice of solvent for absorption. **07**
 (b) For given liquid flow rate give stepwise procedure to determine minimum liquid gas ratio for absorbers. **07**

OR

- Q.3** A counter-current plate absorber is to be installed for scrubbing of an air mixture 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. **14**

- Q.4** (a) Explain with a neat sketch the material balance for multi-stage liquid-liquid extraction. **07**
 (b) Define liquid extraction giving suitable example. Explain equilateral – triangular co-ordinate and the mixture rule. **07**

OR

- Q.4** If 1000 kg/h of a nicotine (C)-water (A) solution containing 1% nicotine is to be 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. **14**

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** (a) Differentiate between Packed Tower and Tray Tower. **07**
 (b) Write short note on Bollman extractor. **07**

OR

- Q.5** (a) Discuss preparation of the solids for leaching in detail **07**
 (b) Explain counter current multiple contact , Shanks system for leaching. **07**
