

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V • EXAMINATION – SUMMER 2013****Subject Code: 150404****Date: 20-05-2013****Subject Name: Principles of Process Engineering-II****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) Explain ternary diagram for one pair partially miscible. Also show the effect of temperature on the solubility curve of ternary diagram. **07**
 (b) Give stepwise procedure to find the minimum liquid gas ratio in absorption. **07**
- Q.2** (a) Explain the concept of HETP, NTU & HTU in packed towers. **07**
 (b) Derive Kremser – Souder – Brown equation for determination of number of theoretical stages analytically. **07**
- OR**
- (b) Discuss the factors to be considered in choice of solvent for liquid – liquid extraction. Explain why selectivity for a good solvent must exceed unity. **07**
- Q.3** (a) If 100 kg of a solution of acetic acid & water containing 30% acid is to be extracted three times with isopropyl ether at 20° C using 40 kg of solvent in each stage, determine the quantities and compositions of the various streams. How much solvent would be required if the same final raffinate concentration were to be obtained in one stage. **07**
 (b) State the advantages of using reflux in continuous counter current extraction. **07**
- OR**
- Q.3** (a) Give the methods of preparation of different types of solids for leaching operation. **07**
 (b) Explain counter current multi stage Shank's system for leaching. **07**
- Q.4** (a) Percolation v/s Agitation in leaching. **04**
 (b) Draw classification chart of mass transfer operation with examples of each in detail and definitions of operations in each category. **10**
- OR**
- Q.4** (a) Explain Bollman Extractor with principle, working and neat diagram. **04**
 (b) Starting from Fick's first law of diffusion for unidirectional binary gas phase, derive the equation to calculate N_A for steady state molecular diffusion of A through non-diffusing B. **10**
- Q.5** (a) State, explain and derive mathematical "two resistance theory" for local two phase mass transfer in detail. **10**
 (b) Oxygen (A) is diffusing through CO (B) under steady state conditions with the CO non diffusing. The total pressure is $1 \times 10^5 \text{ N/m}^2$ and the temperature is 0°C. The partial pressure of oxygen at two planes 2mm apart is respectively 13000 and 6500 N/m². The diffusivity for the mixture is $1.87 \times 10^{-5} \text{ m}^2/\text{s}$. Calculate the rate of diffusion of oxygen in kmol/s through each square meter of the two planes. **04**
- OR**
- Q.5** (a) State various theories used in mass transfer to explain meaning of mass transfer coefficients and explain any one theory in detail. **08**
 (b) Explain the estimation of diffusivity of gases and liquids theoretically and also describe its dependency on temperature and pressure. **06**