

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V • EXAMINATION – WINTER 2013****Subject Code: 150404****Date: 02-12-2013****Subject Name: Principles of Process Engineering - II****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.
4. Notations used have their conventional meaning.

- Q.1** (a) Explain ternary equilibria and change in the shape of binodal solubility curve for different types of system in case of liquid extraction. **10**
- (b) Enlist various factors to be considered while making a choice of solvent for liquid – liquid extraction. **04**
- Q.2** (a) Discuss various mechanical problems encountered during operation of packed tower. **07**
- (b) Give stepwise procedure to determine minimum liquid gas ratio for absorber. **07**
- OR**
- (b) Explain the concept of HETP, HTU and NTU in a packed-bed absorption column. **07**
- Q.3** (a) Write a short note on Percolation tanks used for leaching with neat diagram. **07**
- (b) Describe the methods of preparation of solids for leaching operations. **07**
- OR**
- Q.3** (a) What is leaching? Discuss the different types of equilibrium diagram for leaching. **07**
- (b) Explain counter current multiple contact, Shanks system of leaching. **07**
- Q.4** (a) Discuss important characteristics of packing materials used in packed tower. **04**
- (b) Differentiate between direct and indirect mass transfer operations in detail. **06**
- (c) Define and explain molecular and eddy diffusion with examples. **04**
- OR**
- Q.4** (a) State fields of usefulness of liquid-liquid Extraction in brief. **04**
- (b) Define and explain F-type and k-type mass transfer coefficients along with their units. **06**
- (c) Write a short note on “Diffusion through Solids”. **04**
- Q.5** (a) Starting from Fick’s first law of diffusion for binary liquid phase, derive an expression of N_A for steady state molecular diffusion of A through non-diffusing B. **07**
- (b) Calculate the rate of diffusion of Acetic acid (A) across a film of non-diffusing water (B) solution 1 mm thick at 17°C when the concentrations on opposite sides of the film are respectively, 9 and 3 weight % acid. The diffusivity of acetic acid in the solution is $0.95 \times 10^{-9} \text{ m}^2/\text{s}$. Density of 9 and 3 weight % aqueous solutions is 1012 and 1003.2 kg/m³ respectively. $M_A = 60$, $M_B = 18$ **07**
- OR**
- Q.5** (a) Explain the concept of equilibrium and principles for interphase mass transfer between two insoluble phases. **06**
- (b) Derive statement of penetration theory of mass transfer coefficient along with neat sketches and assumptions used in it. **08**