

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-V • EXAMINATION – WINTER • 2014

Subject Code: 150404

Date: 01-12-2014

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.**

- Q.1** (a) Differentiate between direct and indirect mass transfer operations with examples. **07**
(b) State Fick's first law of diffusion and explain N_A and J_A . Also, prove that for unidirectional binary diffusion $J_A = -J_B$. **07**
- Q.2** (a) State different theories explaining the meaning of mass transfer coefficients. Explain any one in detail. **07**
(b) Explain concept of equilibrium for interphase mass transfer. **07**
- OR**
- (b) Oxygen is diffusing through non-diffusing mixture of methane and hydrogen in volume ratio of 2:1. 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 2 mm apart is respectively 13000 and 6500 N/m^2 . The diffusivities are as...
- $$D_{\text{Oxygen-Hydrogen}} = 6.99 \times 10^{-5} \text{ m}^2/\text{s}$$
- $$D_{\text{Oxygen-Methane}} = 1.86 \times 10^{-5} \text{ m}^2/\text{s}$$
- Calculate the rate of diffusion of oxygen.
- Q.3** (a) Explain the selection criteria for choice of solvent for absorption. **07**
(b) Define and explain the terms : **07**
Tray efficiency, Murphree efficiency, HETP, HTU and NTU.
- OR**
- Q.3** (a) Write a short note on minimum liquid gas ratio for absorbers. **07**
(b) Explain Adsorption factor 'A' for gas adsorption in detail. **07**
- Q.4** (a) Write a short note on "preparation of solids for leaching". **07**
(b) Explain the selection criteria for choice of solvent for liquid extraction. **07**
- OR**
- Q.4** (a) Explain with a sketch the material balance for single stage liquid-liquid extraction. **07**
(b) Write a short note on absorption with chemical reaction. **07**
- Q.5** (a) What is leaching? What are the industrial applications of leaching? Discuss the different types of equilibrium diagram for leaching. **07**
(b) Define liquid extraction giving typical examples. Explain equilateral triangular co-ordinates and the mixture rule. **07**
- OR**
- Q.5** (a) Write a short note on Bollman Extractor. **07**
(b) Explain counter current multiple contact, Shanks system for leaching. **07**
