

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V (NEW) EXAMINATION – WINTER 2018****Subject Code:2150404****Date:20/11/2018****Subject Name:Principles of Process Engineering-II****Time: 10:30 AM 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 the following terms with respect to tray towers: **03**

(i) Flooding (ii) Priming (iii) Coning

(b) Differentiate between packed tower v/s tray tower. **04**

(c) Derive equations to calculate rate of steady state diffusion of 'A' through non-diffusing 'B' and also for steady state equimolal counter diffusion in case of gases. **07**

Q.2 (a) Define: (i) Tie-line (ii) Operating line (iii) Raffinate **03**

(b) What are different types of packing. **04**

(c) Compare surface renewal and Penetration theories. **07**

OR

(c) Differentiate between direct and indirect mass transfer operations with examples. **07**

Q.3 (a) Discuss local and overall mass transfer coefficients. **03**

(b) Explain steps to determine minimum liquid to gas ratio for absorbers. **04**

(c) Explain counter current multiple contact, Shanks system for leaching with neat figure. **07**

OR

Q.3 (a) With neat diagram discuss Venturi Scrubber. **03**

(b) Explain criteria of solvent selection for gas absorption. **04**

(c) A packed tower is to be designed to absorb sulfur dioxide from air by scrubbing the gas with water. The entering gas is 18.6% SO₂ by volume. The water flow is to be 2.3 times the minimum. The air flow rate (SO₂ free basis) is 1100 m³/hr. The temperature is 30 °C and the total pressure is 2 atm. The equilibrium data is governed by $y=21.8x$ where y and x are in mole fractions units. Compute the number of overall gas phase transfer units. **07**

Q.4 (a) Explain preparation of solids for leaching. **03**

(b) Explain material balance for single stage extraction. **04**

(c) Discuss in detail about Film theory for mass transfer coefficient. **07**

OR

Q.4 (a) Explain the following terms with respect to tray towers: **03**

(i) weeping (ii) dumping (iii) tray spacing

(b) Write short note on gas absorption with chemical reaction. **04**

(c) Derive equation for material balance for single stage countercurrent leaching. **07**

- Q.5 (a) Enlist industrial applications of gas absorption and leaching. **03**
(b) Explain criteria of solvent selection for extraction. **04**
(c) Write short note on Bollman extractor with neat sketch. **07**

OR

- Q.5 (a) Explain fick's law of diffusion. **03**
(b) Explain different components of tray tower. **04**
(c) Define liquid extraction giving typical example. Explain **07**
equilateral-triangular co-ordinate and the mixture rule.

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