## **GUJARAT TECHNOLOGICAL UNIVERSITY** BE – SEMESTER – V (NEW) EXAMINATION – WINTER 2015

Subj	ect	Code: 2150404 Date:10/12/202	15					
Subj Time	ect 2 e:10	Name: Principles of Process Engineering-IITotal Marks::30am to 1:00pmTotal Marks:	70					
instru	1. 2. 3.	Attempt all questions. Make suitable assumptions wherever necessary. Figures to the right indicate full marks.						
Q.1	(a)	Derive equations to calculate flux of steady state diffusion of 'A' through non diffusing 'B' for asses	07					
	(b)	Oxygen (A) is diffusing through carbon monoxide (B) under steady state <b>0'</b> condition with the carbon monoxide non-diffusing. The total pressure is $1 \times 10^5 \text{ N/m}^2$ , and the temperature 0 °C. The partial pressure of oxygen at two planes 2 mm apart is, respectively 13000 and 6500 N/m <sup>2</sup> . The diffusivity for the mixture is $1.87 \times 10^{-5} \text{ m}^2$ /s. Calculate the rate of diffusion of oxygen in kmol/s through each square meter of the two planes.						
Q.2	(a)	Differentiate between direct and indirect mass transfer operations with 07 examples.						
	(b)	Give comparison of Random packing and stacked packing. 07						
	(b)	<b>OR</b> Write a short note on Bollman Extractor.						
Q.3	(a)	Define: HETP. Derive equation for height of gas transfer unit for a						
	(b)	continuous packed bed absorption tower. A packed tower is designed to recover 98% CO <sub>2</sub> from a gas mixture <b>07</b> containing 10% CO <sub>2</sub> and 90 % air using water. A relation $y = 14$ x is used for equilibrium conditions where $y = \text{kg CO}_2/\text{kg}$ dry air and $x = \text{kg CO}_2/\text{kg}$ water. The water to gas rate is kept 30 % more than minimum value. Calculate the height of tower if HTU is 1 m.						
0.3	(a)	OR						
Q.3	(a) (b)	Define and explain the terms : a. Flooding b. Priming c. Coning d. Weeping e. Dumping f. Tray spacing g. Theoretical tray	07 07					
Q.4	(a) (b)	Discuss in detail about film theory for mass transfer coefficient. Discuss the equipments used for leaching of vegetable seeds and explain any one in detail.						
04	(ച)	<b>OR</b> Explain preparation of solids for leaching	07					
Y.4	(a)	Explain preparation of solids for leaching.	07					

(b) 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 to0.1%, determine (a) the minimum kerosene rate and (b) the number of theoretical stage required if 1150 kg of kerosene is used per hour.

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) Explain with a neat sketch the material balance for multi-stage liquid-liquid 07 extraction.
  - (b) For a given liquid flow rate give step wise procedure to calculate minimum 07 liquid to gas ratio for absorbers.

## OR

Q.5	<b>(a)</b>	With a neat diagram discuss Venturi Scrubber.	07
	<b>(b)</b>	Differentiate between packed tower v/s tray tower.	07

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