GIET UNIVERSITY, GUNUPUR – 765022

RD19MTECH024

Registration No: | | | | | | | | | | |

Total Number of Pages : 02 **M.TECH**

AR-19

M.TECH 1ST SEMESTER EXAMINATIONS NOV/DEC 2019

Branch: MD, MPCCH1020

ADVANCED MASS TRANSFER

Time: 3 Hours **Max Marks : 70**

The figures in the right hand margin indicate marks.

PART-A (10 X 2=20 MARKS)

1. Answer all question

a) The species A diffuses through gas mixture A-B from point x=0, y=y_o to x=l, y=y at temperature T and pressure P. The total pressure is now doubled, but the mole fractions, T and P remains same as before. What would be the fractional increase in the flux of A?

b) Equimolar counter diffusion occurs in binary mixture A-B through a spherical film of ineer diameter r and thickness t. The flux of A is N_A at r. The flux through a flat film of same thickness is N_B What is the fractional increase in thickness if N_A is greater than N_B by 5%?

c) Classify mass transfer operations with suitable examples.

d) Define interphase mass transfer.

e) Write short notes on individual mass transfer coefficient.

f) The species A diffuses through gas mixture A-B from point x=0, y=y_o to x=l, y=y at temperature T and pressure P. The total pressure is now doubled, but the mole fractions, T and P remains same as before. What would be the fractional increase in the flux of A? (K_2)

g) What is Distribution Coefficient

h) What are the factors depends on leaching action?

i) Distinguish between physical adsorption and chemisorptions.

j) Explain when Knudsen diffusion occurs in solids

PART-B (5 X 10=50 MARKS)

2. Design the packed tower on the basis of individual mass transfer coefficients or on the basis of overall mass transfer coefficient for a gas-liquid system.
3. Equimolar counter-diffusion of A and B occurs between points 1 (yA1=0.3) and 2 (yA2=0.1) through a distance of 1 cm. Total pressure is 1 atm, temperature is 250C and diffusivity is 0.2 cm2/s. What is the "diffusion velocity" of „A" halfway in the diffusion path?
4. Determination of the Rectifying section operating line (ROL) and feed section operating line .
5. Formulate the ideal parameter of the Equilibrium solubility of gases in liquids for the Selection of solvent for absorption and stripping. Discuss the characteristics of the Packing Materials.

6. i)Derive the relationship between the overall mass transfer coefficient and individual mass transfer coefficients as $\frac{1}{K_y} = \frac{1}{k_y} + \frac{m}{k_x}$

   Assume the equilibrium-distribution represent a straight line. The notations imply their usual meanings.

   ii) Why are k-type mass transfer coefficients for very dilute solutions more significant than F-type mass transfer coefficients
7. Explain Diffusivity or Diffusion co-efficient? Derive the expression for Steady State molecular diffusion in Gases mentioning particular about

   i)Steady State Diffusion of gas A through a stagnant gas B

   ii) Equimolar counter diffusion
8. A feed 100 kmoles/h of saturated liquid containing 10 mole % LNK, 55 mole % LK, and 35 mole % HK and is to be separated in a distillation column. The reflux ratio is 1.2 the minimum. It is desired to have 99.5 % recovery of the light key in the distillate. The mole fraction of the light key in the distillate should be 0.75. Equilibrium data: $\alpha_{LNK=4.0}$, $\alpha_{LK=1.0}$ $\alpha_{HK=0.75}$ Find (i) Minimum number of stages required by Fenske method (ii) Minimum reflux ratio by Underwood method (iii) Number of ideal stages at R = 1.2 Rmin by Gilliland method (iv) Also find the number of ideal stages at rectifying section and the stripping section at the operating reflux ratio and location of feed stage.