Printed Pages: 4 **NCH-608**

(Following Paper ID and Roll No. to be filled in your Answer Books)	
Paper ID : 151618	**Roll No.**

B.TECH.

Theory Examination (Semester-VI) 2015-16

MASS TRANSFER OPREATION

Time : 3 Hours ***Max. Marks : 100***

Section-A

1. Attempt all the parts. All parts carry equal marks. Write answer of each part in short. (2×10=20)

(a) What is the difference between molecular diffusion and turbulent diffusion'?

(b) Define the mass transfer coefficient and overall mass transfer coefficients.

(c) Differentiate between physical adsorption chemisorptions?

(d) What are the criteria for selecting solvent in Gas Absorption?

(e) What are the industrial applications of mass transfer operations?

(f) Define Bound and unbound moisture content.

(g) Define ficks law of diffusion.

(h) What are the characteristics to be possessed by industrial adsorbents?

(i) What are the Comparison of Gas Absorption and Distillation?

(j) Define Absolute and relative humidity .

Section-B

2. Attempt any five questions from this section. (10×5=50)

(a) A narrow tube is partially tilled with a liquid and maintained at a constant temperature. A gentle stream of gas is passing across the open end of the.tube. As the liquid evaporates, the level drops slowly. At a given time t, the level is Z from the top. Derive an equation to calculate the value of the diffusivity of the liquid vapour in the gas.

(b) In an Oxygen-nitrogen mixture at 10 atm and 25°C, the concentrations of oxygen at two places of 0.2 cm apart are 10 and 20 volume percentage respectively. Calculate the rate of diffusion of oxygen expressed as gm/cm^2 hr for the case of unicomponent diffusion (nitrogen is non diffusing).Value of diffusivily is 0.181 cm^2/ sec.

(c) A mixture of 35 mole % of 'A' and 65 mole % 'B' is to be separated in distillation column. The concentration of A in the distillate is 93 mole % and 96 mole % of component A is recovered in distillate. The feed is half vapor and reflux ratio is 4:1. The relative volatility is $\alpha_{AB} = 2.5$. Calculate the number of theoretical plates in the column ?

(d) What is the adsorption isotherm? Explain the Freundlich and Langmuir adsorption isotherm with limitations.

(e) A slab of paper pulp 100 cm × 100 cm × 1.5 cm is to be dried under constant drying conditions from 66.7% to 30% moisture. The value of equilibrium moisture for material is 0.5%. If critical moisture content is 60% and the rate of drying at the critical point is 1.5 kg hr m^2, calculate the drying time. The dry weight of each slab is 2.5 kg. All the moisture content are on wet basis.

(f) Classify the various types of dryer and explain the construction and working of a Rotary dryer ?

(g) Explain the penetration and film theory of mass transfer Operations ?

(h) Derive an expression for the steady state diffusion of A through non diffusing B for the gases system ?

Section-C

Attempt any two questions from this section. (15×2=30)

3. Derive the equations for the operating lines of rectifying and stripping sections Used according to the ponchon-savant method for the design of distillation column. State the assumptions clearly.

4. (a) Derive the Rayleigh equation and mention the assumption involved during derivation.

   (b) Derive the equations of feed line in Mc Cabe Thiele method.

5. Experiments on Decolourisation of oil yielded the following equilibrium relationship $y = 0.5\ x^{0.5}$ where y = g colour removed / g adsorbent, x = colour in oil, g colour / 1000g colour-free oil.

   100 kg oil containg 1 part of colour to 3 parts of oil is agitated with 25kg of adsorbent.

   Calculate the % colour remove if

   (i) all 25kg of adsorbent is used in one-step

   (ii) 12.5 kg of adsorbent is used initially, foil wed by another 12.5 kg of adsorbent.