Printed Pages: 4 **NCH-403**

(Following Paper ID and Roll No. to be filled in your Answer Books)	
Paper ID : 151411	**Roll No.**

B.TECH.

Theory Examination (Semester-IV) 2015-16

MASS TRANSFER-I

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

Note: Attempt all sections.

Section-A

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

(a) Define Dew point temperature.

(b) Define Humid volume.

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

(d) Define Absolute humidity.

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

(f) Define absorption factor and its significance.

(g) Define unbound moisture content.

(h) Define the mass transfer coefficient.

(i) Define Super saturation.

(j) Write the significance of wetted wall column.

Section-B

2. Attempt any five questions from this section. [10×5=50]

(a) A narrow tube is partially filled 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) Write the any two name of the crystallizer. Explain in detail any one of them with neat sketch.

(c) A slab of paper pulp 100cmx100cmx1.5cm 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 m2, calculate the drying time. The dry weight of each slab is 2.5 kg. All the moisture content are on wet basis.

(d) Air at 1 atm is blown past the bulb of a mercury thermometer. The bulb is covered with a wick. The wick is immersed in an organic liquid (molecular weight = 58). The reading of thermometer is 7.6°C. at this temperature, the vapour pressure of the liquid is 5 kPa. Find the air temperature, given that ratio of heat transfer coefficient to mass transfer coefficient (psychrometric ratio) is 2 kJ/kg K and latent heat of vaporization of the liquid is 360 kJ/ kg. Assume that the air which is blown, is free from the organic vapour.

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

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

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

(h) Explain the construction and operation of packed bed absorption tower with the help of neat diagram.

Section-C

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

3. A batch of 1100 kg of KCl is dissolved in sufficient water to make a saturation solution at 363 K where the solubility is 35 wt % KCl in water. The solution is cooled to 293 K, at which the temperature its solubility is 25.4 wt %.

   i. What is the weight of water required for solution and the weight of crystals of KCl obtained?

   ii. What is the weight of crystals obtained if 6 % of the original water evaporates on cooling?

4. Give the classification of cooling tower based on air drift. Explain the construction and operation of a forced draft cooling tower with neat sketch.

5. 5000 kg/hr of SO_2 - Air mixture containing 5 % by volume of SO_2 is to be scrubbed with 100000 kg/ hr of water in a packed tower. The exit concentration of SO_2 is reduced to 0.15%. the tower operates at 1 atm. The equilibrium relation is given by Y= 15 X. where Y and X are mole of SO_2 per mole of air and moles of SO_2 per moles of water. Given that packed height of tower is 0.42 m, calculate the height of transfer unit.