6+2=(08)

SHAHEED BHAGAT SINGH STATE TECHNICAL CAMPUS, FEROZEPUR

ROLL No: | | | | | | | | | | | | Total number of pages:[2]

Mass Transfer-I (New)

Subject Code :BTCH- 402, 4th Sem (RP)

Paper ID :

Batch: 2011onwards - 2014 batch)

Paper ID: M118

Time allowed: 3 Hrs Max Marks: 60

Important Instructions:

- **All questions are compulsory**
- **Assume any missing data**
- **Additional instructions, if any**

PART A (10x 2marks)

Q. 1. Short-Answer Questions:

(a) Explain the term diffusivity and its units.
(b) What is eddy diffusion?
(c) Draw a graph showing concentration gradient for equimolal counter current diffusion.
(d) Write down the properties of a good packing for an absorption tower.
(e) What is Schmidt number and its significance?
(f) What is Lewis number?
(g) What is meant by holdup in a rotary dryer?
(h) Define Bubble point.
(i) Define the term "Equilibrium moisture content".
(j) Define 'Absorption factor.

PART B (5×8marks)

Q. 2. Discuss the steady state diffusion of A through a non-diffusing B and show how the diffusion rate will be modified when component B is counter diffusing. CO1

OR

Derive from first principles an expression for steady state diffusion of a liquid species A through a stagnant liquid species B.

Q. 3. What is Surface renewal theory of Mass Transfer? Explain the physical significance of this theory and derive the governing expression. CO2

OR

Discuss the need for defining the interphase mass transfer resistance in terms of overall coefficients. Drive their relation.

Explain the psychrometric chart with the help of a neat sketch. Also indicate

Q. 4. the method of obtaining the various characteristic curves for a given gas-solvent vapor system. CO3

OR

A wet solid material is dried from 0.7 kg water/kg dry solid to 0.08 kg water/kg dry solid in a continuous counter-current drier from which the product flows out at the rate of 500 kg/hr. The inlet air to the drier is at 54°C with an initial humidity of 0.015 kg water/kg of dry air and the exit air is at 32.2°C with 80% saturated humidity. Calculate the inlet air rate in m^3/hr and the heat supplied by the preheater if the atmospheric temperature is 24°C.

Data:

Saturated humidity at 32.2°C = 0.025 kg water/kg dry air

Specific volume of dry air at 54°C = 0.925 m^3/kg

Saturated volume = 1.09 m^3/kg

Humid heat 0.015 humidity = 0.243 cal/gm°C

Humid heat at 32.2°C and at 80% saturated humidity = 0.250 cal/gm°C CO4

Q. 5. Explain how the height of packing for an absorber can be calculated.

OR

Discuss the concept of the transfer units used in mass transfer problems. How is overall height of a transfer unit related to the individual heights of transfer unit.

Q. 6. What are the various types of membranes used in industrial operation? What do you mean by 'Concentration Polarization'. On what factors does it depend ? Derive a relation for permeate flux through an UF membrane. CO4

OR

Write short notes on:

(i) Electrodialysis

(ii) Ultrafiltration

(iii) Reverse osmosis