Code No: RT32082 **R13** SET - 1

III B. Tech II Semester Regular/Supplementary Examinations, April -2018

MASS TRANSFER OPERATIONS-II

(Chemical Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1 a) Write a short note on the characteristics of packing materials. [5M]

b) List leaching equipments with specific applications. [5M]

c) Define (i) equilibrium moisture (ii) bound moisture (iii) unbound moisture [3M]

d) Explain briefly about the adsorption wave. [2M]

e) Explain about ion exchange techniques. [3M]

f) What is the basic principle of membrane separation? Explain the types of transport through membrane? [4M]

PART –B

2 a) A binary solution containing 10% by weight solute C dissolved in carrier A is fed to a three stage countercurrent extraction unit at a rate of 1000 kg/h. Pure solvent B is used for extraction at rate 800 kg/h. determine [8M]
i) The composition of the final raffinate
ii) The composition of the final raffinate, if the same total quantity of solvent is used in equal amounts in a three stage crosscurrent unit.
The equilibrium data is:

Kg C / kg A	0.05	0.1	0.15
Kg C / kg B	0.069	0.159	0.258

b) With suitable figures explain the working principle ofmechanically agitated counter-current extraction. [8M]

3 a) A certain material was dried under constant drying conditions and it was found that 2 hours are required to reduce the free moisture concentration from 20% to 10%. How much longer would be required to reduce the free moisture to 4%. Assume that no constant rate period is encountered. [8M]

b) From experiments on batch drying of sheet material, the rate of drying in the constant rate period is found to be 3 kg water/h m^2. The critical moisture content is 33% and the equilibrium moisture content is negligible. The sheet have the surface area of 2 m^2 and thick ness 0.1 m should be dried from 50% moisture to 5% moisture. All moisture contents on dry basis. If the material has a bone dry density of 1200kg/m^3, calculate the time required for drying. Assume that the falling rate period is linear in the moisture content. [8M]

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4 a) Vegetable oil seeds containing 100 gram insoluble solid and 10 gram oil are contacted with 200 gram of organic solvent in a single stage leaching operation. The solvent is fresh. Determine the amount of oil left in the oil seeds after leaching. The equilibrium data can be expressed as : N=-4y+8 [8M]
Where N= gram insoluble/(gram solvent+ gram oil)
Y= gram oil/(gram solvent+ gram oil) in the seed phase
X=gram oil/(gram solvent+ gram oil) in the solvent phase
The tie line data:

y	0.26	0.28	0.31	0.34
x	0.02	0.04	0.06	0.08

b) What are the characteristics to be possessed by industrial adsorbents? What are the commonly used adsorbents? [8M]

5 a) Compare the several adsorption isotherm you know of and discuss their importance in adsorption steps in a chemical engineering operation. [8M]

b) What is apparent adsorption? Explain adsorption of solute from dilute solution. [8M]

6 a) Derive the rate of adsorption in fixed beds? [10M]

b) What are the factors determining rate of ion exchange? [6M]

7 a) Explain the types of synthetic membranes. [8M]

b) Explain the phenomenon of reverse osmosis with neat sketch? List out advantages of reverse osmosis process. [8M]

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