Roll No. | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (Chemical Engg.) (Sem.–4)

MASS TRANSFER-I

Subject Code : BTCH-402B

M.Code : 78132

Date of Examination : 05-07-22

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Write briefly :

a) Define molecular diffusion.

b) Give the physical significance of the dimensionless groups in mass transfer.

c) Define Fick's first law of diffusion.

d) What is the physical significance of HTU?

e) What is Reflux Ratio?

f) What is batch distillation?

g) List out the assumptions for McCabe Thiele method?

h) What are the common packings and materials for a cooling tower?

i) What is equimolar counter diffusion?

j) What is Raoult's law?

SECTION-B

2. In an oxygen - nitrogen mixture at 10 atm and 25°C, the concentration of oxygen at two places of 2mm apart are 10 and 20 volume percent 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 diffusivity is 0.181 cm^2/sec.

3. Briefly explain the penetration theory of mass transfer coefficient.

4. Explain loading and flooding in packed towers.

5. Explain properly with diagram, the drying rate curve.

6. It is desired to separate a feed mixture containing 40% heptane and 60% ethyl benzene, such that 60% of the feed is in distillate. Estimate the composition of the bottoms and distillate when the process distillation is equilibrium distillation. Given equilibrium data :

x :	0	0.08	0.185	0.251	0.335	0.489	0.651	0.79	0.914	1.0
y :	0	0.233	0.428	0.514	0.608	0.729	0.814	0.91	0.963	1.0

x : mole fraction of heptane in liquid phase and

y : mole fraction of heptane in vapour phase.

SECTION-C

7. Differentiate packed towers with tray towers.

8. a) Discuss the criteria for choice of solvent for liquid - liquid extraction.

   b) Explain with neat diagram the material balance for the multi stage liquid - liquid extraction.

9. Explain the characteristics of azeotropes with T-x-y and P-x-y diagrams.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.