C14–CH/CHST-406

4434

BOARD DIPLOMA EXAMINATION, (C–14)
MARCH/APRIL—2018
DCHE—FOURTH SEMESTER EXAMINATION
MASS TRANSFER OPERATIONS–I

Time : 3 hours] [*Total Marks* : 80

PART—A

3×10=30

Instructions : (1) Answer **all** questions.
(2) Each question carries **three** marks.
(3) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.

1. Define mass transfer operation. Give example.
2. Define Reverse osmosis process.
3. Write the definitions of (a) Diffusion (b) Molecular diffusion.
4. What are the various types of fluxes used in diffusion process? Mention the significance fluxes.
5. Define batch and continuous contact processes.
6. Define phase rule and write the application of phase rule.
7. Define (a) Raoult's law (b) Ideal solution
8. State Rayleigh's equation.
9. Distinguish between plate tower and packed tower.
10. Write about the tower packings.

PART–B

10×5=50

Instructions : (1) Answer *any* **five** questions.
(2) Each questions carries **ten** marks.
(3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. Oxygen (A) is diffusing through carbon monoxide (B) under steady-state conditions, with the carbon monoxide non-diffusing. The total pressure is $1\times10^5 N/m^2$, and the temperature is 273K. The partial pressures of oxygen at two planes 4mm apart is $0.13\times10^5 N/m^2$ and $0.065\times10^5\ N/m^2$. The diffusivity for the mixture is $1.87\times10^{-5} m^2/s$. Calculate the rate of diffusion of oxygen in kmol/s through each square meter of two planes.

12. *(a)* State and explain Fick's first law of diffusion.

(b) Write the differences between molecular diffusion and eddy diffusion.

13. *(a)* Write in brief about batch contact and continous contact operations.

(b) Explain two resistance theory in detail.

14. A continuous fractionating column is to be designed to separate 3000 gm moles/hr of a mixture of 40% A and 60% B. The overhead product contains 90% of A and bottom product contains 95% of B. These percentages are mole percentages. The feed is at its bubble point and the vapour leaving the column is condensed completely. Calculate—

(a) the moles of overhead and bottom product;

(b) the actual number of plates required for the separation and the position of the feed plate using McCabe-Thiele method.

Equilibrium data is given below :

x	0	0.1	0.2	0.3	0.4	.05	0.6	0.7	0.8	0.9	1.0
y	0	0.21	0.38	0.51	0.62	0.71	0.78	0.82	0.91	0.96	1.0

15. Describe in detail the steps involved in McCabe-Thiele method.

16. Write short notes on the following:

(a) Equilibrium distillation

(b) Distinction between batch distillation and continuous distillation

17. Explain in detail the factors to be considered while selecting solvent for gas absorption.

18. A mixture containing 10% solute and rest inert is fed to packed tower in which 90% of solute is absorbed, solute-free water is used for absorption contains 5% solute when it leaves the tower at the bottom. If the relation $Y_e=0.05X_e$, $H_{OG}=0.5$ and $H_{OL}=0.4$m, what is the height of the packed section?

* * *