

B.Tech. Seventh Semester (Food, Pulp & Paper, Oil & Paint & Petro Technology) (CGS)
11056 : Mass Transfer : 7 CT 01

P. Pages : 2

Time : Three Hours



AU - 2944

Max. Marks : 80

- Notes :
1. Answer **three** question from Section A and **three** question from Section B.
 2. Due credit will be given to neatness and adequate dimensions.
 3. Assume suitable data wherever necessary.
 4. Diagrams and chemical equations should be given wherever necessary.
 5. Illustrate your answer necessary with the help of neat sketches.
 6. Use of pen Blue/Black ink/refill only for writing the answer book.

SECTION - A

1. a) Explain the diffusion through a stationary film. 6
b) Ammonia is absorbed in water from a mixture with air, using a column operating at 101.3 kN/m² and 295K. Resistance for transfer can be regarded as lying entirely within the gas phase. At a point in the column, the partial pressure of ammonia is 7kN/m². The back pressure at the water interface is negligible and the resistance is in the gas film of 1mm thick. If the diffusivity of ammonia in air is $2.36 \times 10^{-5} \text{ m}^2/\text{sec}$, what is the transfer rate per unit area at that point in the column? How would the rate of transfer be affected if ammonia-air mixture is compressed to double the pressure? 7

OR

2. a) Explain interphase mass transfer diffusion between two phases and the concept of overall transfer coefficient. 6
b) Discuss various mass transfer theories and mass transfer analogies. 7
3. a) Explain the terms partial pressure, Dalton's law, Rault's law and Henry's law. 6
b) What is reflux ratio and explain its importance in fractionation. 7

OR

4. a) What do you mean by batch distillation and equilibrium distillation? Explain the difference between these types of distillation. 7
b) Discuss the effect of feed temperature on the number of plates in the distillation column and develop an expression of q-line. 6
5. a) What do you mean by fouling of membrane and how to control it? 7
b) What are the types of ternary system and how to select solvent for liquid-liquid extraction. 7

OR

6. a) Explain the different types of membranes and salient features of crossflow filtration. 7
- b) What do you mean by selectivity of solvent and derive an expression for number of stages required with co-current contact of the immiscible solvents in liquid-liquid extraction where the distribution law is followed. Explain the graphical procedure for finding the number of stages required. 7

SECTION – B

7. a) Discuss the factors affecting the leaching process and derive an expression for variation of concentration of product of leaching as a function of time. 7
- b) Seeds containing 20% by weight of oil are extracted in a countercurrent plant and 50% of the oil is recovered in a solution containing 50% by weight of oil. If the seeds are extracted with fresh solvent and 1kg of solution is removed in the underflow in association with every 2kg of oil insoluble matter, how many stages are required. Use graphical method. 6

OR

8. a) Explain the classification of solid-liquid extraction units and explain of any one. 7
- b) Derive an expression for number of ideal washing stages (thickeners) required for counter current multistage multi-contact system for constant underflow of solvent in each stage. 6
9. a) Explain the basic principle of crystallization and Mier's supersaturation criteria. 7
- b) Discuss in details the factors affecting nucleation in a crystallization process. 6

OR

10. a) A saturated solution containing 1500kg of KCl at 360K is cooled in an open tank to 290K. If the specific gravity of the solution is 1.2 and the solubility of KCl per 100 parts of water is 53.55 kg at 360K and 34.5 kg at 290K. Calculate : 7
- i) Capacity of the tank.
- ii) Weight of crystals deposited.
- b) Explain the classification of crystallization equipments and explain operation of any one equipment. http://www.sgbauonline.com 6
11. a) How are dryers classified on the basis of heat transfer? Explain in details. 7
- b) Wet solid is to be dried from 35% to 10% moisture under constant drying conditions in five hours. If the equilibrium moisture content is 4% and the critical moisture content is 14%. How long will it take to dry solids to 6% moisture under the same conditions? 7

OR

12. a) Derive an equation used for calculation of the time required for drying under constant drying conditions. 7
- b) What are the various theories of drying? Explain any one in details. 7
