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Paper Id: | 151223 | **Roll No.** | | | | | | | | | | |

B TECH
(SEM-VI) THEORY EXAMINATION 2018-19
MASS TRANSFER OPERATION–II

Time: 3 Hours   *Total Marks: 100*

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. **Attempt *all* questions in brief.**   **2 x 10 = 20**

   a. Define quantity 'q'.
   b. Define reflux ratio and how does it helps in improving the purity of the top product in rectification section.
   c. State the various industrial applications of adsorption.
   d. What are the limitations of distillation?
   e. What is stripping factor?
   f. What is a plait point?
   g. What is Murphree tray efficiency?
   h. What is meant by constant molal overflow?
   i. What is tie line?
   j. What is meant by a break through curve for adsorption?

SECTION B

2. **Attempt any *three* of the following:**   **10 x 3 = 30**
   a. Write Freundlich equation and explain its application for two stage cross current adsorption.
   b. Explain the method of estimation of number of stages by Panchon-Savarit method.
   c. Explain how the number of stages can be determined for immiscible solvents in cross current extraction.
   d. What is meant by supersaturation? Give the various methods for generating supersaturation.
   e. Discuss agitated batch crystallizer with neat sketch

SECTION C

3. **Attempt any *one* part of the following:**   **10 x 1 = 10**

   a. What is an azeotrope? Explain the advantages, disadvantages and industrial application of azeotropic distillation with suitable example.
   b. Derive q-line equation for feed tray location.

4. **Attempt any *one* part of the following:**   **10 x 1 = 10**

   a. A mixture of benzene and toluene containing 40 % benzene and 60 % toluene is to be separated in fractionating column to give product containing 96% benzene and a bottom containing 95% toluene feed is a mixture of 2/3rd vapor and one third liquid .Find out the number of theoretical stages required if reflux ratio is 1.5 times the minimum and relative volatility=2.5.
   b. Discuss the factors to be considered while selecting a solvent for liquid extraction.

5. Attempt any *one* part of the following: **10 x 1 = 10**

   a. Explain with a neat sketch the construction & use of triangular charts in liquid extraction.
   b. Define adsorption. Derive the expression for the multistage crosscurrent adsorption.

6. Attempt any *one* part of the following: **10 x 1 = 10**

   a. If 100 kg of a solution of acetic acid (C) and water (A) containing 30% acid is to be extracted three times with isopropyl ether (B) at 20°C , using 40 kg of solvent in each stage, determine the quantities and compositions of the various streams. How much solvent would be required if the same final raffinate concentration were to be obtained with one stage?

Water Layer			Isopropyl ether layer		
Wt% Acetic acid 100x	Water	Isopropyl ether	Acetic acid, 100 y*	Water	Isopropyl ether
0.69	98.1	1.2	0.18	0.5	99.3
1.41	97.1	1.5	0.37	0.7	98.9
2.89	95.5	1.6	0.79	0.8	98.4
6.42	91.7	1.9	1.93	1.0	97.1
13.30	84.4	2.3	4.82	1.9	93.3
25.50	71.1	3.4	11.40	3.9	84.7
36.70	58.9	4.4	21.60	6.9	71.5
44.30	45.1	10.6	31.10	10.8	58.1
46.40	37.1	16.5	36.20	15.1	48.7

   b. Explain the types of equilibrium curves occur in leaching.

7. Attempt any *one* part of the following: **10 x 1 = 10**

   a. Explain the types of equilibrium curves occur in leaching.
   b. Define 'Supersaturation' and explain Mier's supersaturation theory.