

Printed Pages : 4



ECH051

(Following Paper ID and Roll No. to be filled in your Answer Book)

**PAPER ID : 151851**

Roll No.

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**B.Tech**

(SEM. VIII) THEORY EXAMINATION 2014-15

**ADVANCE SEPARATION TECHNOLOGY**

Time : 3 Hours]

[Total Marks : 100

Note: Attempt all questions. Assume suitable data, if required.

All questions carry equal marks.

- 1 Attempt any **four** parts of the following: **5x4=20**
- (a) Write notes on characteristics of membrane.
  - (b) What is the difference between equilibrium governed separation processes and governed separation processes?
  - (c) Explain the uses and characteristics of separation processes.
  - (d) What are the practical applications of liquid membranes?
  - (e) Define silt density index.
  - (f) Write the separation processes used in chemical and biochemical industries.

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- 2 Attempt any **four** parts of the following: **5×4=20**
- (a) Explain the characteristics of ideal cascade.
  - (b) How polymeric membranes are characterized?
  - (c) Give at least four examples of the applications of pervaporation.
  - (d) Write a note on energy requirement for separation process.
  - (e) On which principle does the reverse osmosis work? Give few applications of reverse osmosis.
  - (f) Write the phenomenon of membrane separation processes.
- 3 Attempt any **two** parts of the following: **10×2=20**
- (a) Describe the different kinds of liquid membranes in details. Mention the areas where these membranes are used.
  - (b) Describe the principle and operation of molecular sieves for separation process. Also discuss some mathematical parameters of importance related to molecular sieves.
  - (c) A liquid containing dilute solute A at a concentration  $c_1 = 3 \times 10^{-2} \text{ kgmol/m}^3$  is flowing rapidly by a membrane of thickness  $L=3 \times 10^{-5} \text{ m}$ . The distribution coefficient  $K=1.5$  and  $D_{AB} = 7 \times 10^{-11} \text{ m}^2/\text{s}$  in the membrane. The solute diffuses through the membrane and its concentration on the other side

is  $c_2 = 0.5 \times 10^{-2}$  kgmol/m<sup>3</sup>. The mass transfer coefficient  $kc_1$  is large and can be considered as infinite and  $kc_2 = 2.02 \times 10^{-5}$  m/s.

- (i) Derive the equation to calculate the steady-state flux  $N_A$  and make a sketch.
- (ii) Calculate the flux and the concentration at the membrane interfaces.

4 Attempt any **two** parts of the following: **10x2=20**

- (a) Give few examples of electro dialysis. What are the advantages and disadvantages of having electro dialysis?
- (b) A solution containing 0.9 wt% protein is to undergo ultra filtration using a pressure difference of 5 psi. The membrane permeability is  $A_w = 1.37 \times 10^{-2}$  kg/m<sup>2</sup>.s. atm .Calculate the flux for ultra filtration process. Assume no effect of polarization.
- (c) What is reverse osmosis? Explain the effect of concentration polarization on the process.

5 Attempt any **two** parts of the following: **10x2=20**

- (a) Explain Gas -Liquid chromatography in detail.
- (b) Differentiate between liquid permeation membrane separation and gaseous permeation membranes separation and discuss its limitations and uses.

- (c) Write the short notes on the following:
- (i) Dialysis
  - (ii) Ultrafiltration
  - (iii) Partial coefficient and permeability
  - (iv) Polymeric membranes
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