Code No: 07A70808 **R07** **Set No. 2**

IV B.Tech I Semester Examinations,MAY 2011
MEMBRANE TECHNOLOGY
Chemical Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. Discuss about:
   (a) Importance of spinnerets in tubular membrane.
   (b) Explain the laboratory setup for tubular membrane preparation.
   (c) Write the methods to prepare hallow fiber and capillary membrane. [6+6+4]
2. Write short note on
   (a) Resistance towards mass transport.
   (b) Concentration polarization in pressure driven membranes.
   (c) Fully developed laminar and turbulent flow. [6+4+6]
3. (a) Discuss Henrys law and Langmuir equations.
   (b) Discuss transportation through porous membrane. [8+8]
4. Discuss DSC/DTA physical methods for non porous membrane. [16]
5. (a) Pressure retarded osmosis(PRO) allows to produce energy originating from an osmotic flow due to an osmotic pressure difference.
   (b) Is the maximum power obtained at $\Delta p = 0$?Calculate the power which can be generated from 3% and a 15% NaCl solution respectively, and a membrane permeability of Lp= 0.36 kg/m^2 ,hr.bar(assume vont hoff law is still valid) [8+8]
6. (a) Write the uses of plates and frames in plate and frame module.
   (b) Explain spiral wound module with diagram. [6+10]
7. Write short note on:
   (a) Firkin flux.
   (b) porous membranes.
   (c) Carrier mediated transport.
   (d) Facilitated transport. [4+4+4+4]

8. The pure water flux of a membrane with a diameter of 7.5 cm has been determined as a function of the applied pressure. The following results are obtained:

Δp	flux(mol/hr)
5	103
10	202
15	287
20	386
25	501

Determine the water permeability coefficient graphically. [16]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: 07A70808 **R07** **Set No. 4**

IV B.Tech I Semester Examinations,MAY 2011
MEMBRANE TECHNOLOGY
Chemical Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. Compare the different membranes for basic parameters. [16]
2. Discuss clustering and solubility of liquid mixture. [16]
3. Define:
   (a) Dip coating
   (b) Interfacial polymerization.
   (c) Spray coating.
   (d) Capillary membranes. [16]
4. Explain:
   (a) Boundary layer resistance model.
   (b) Gel layer model. [8+8]
5. Discuss following with diagrammatic representation:
   (a) Asymmetric membranes.
   (b) Porous membranes.
   (c) Homogeneous membranes.
   (d) Cylindrical porous membranes. [16]
6. Write short note on:
   (a) gas separation through non porous membrane.
   (b) choice of organic solvents in liquid membrane. [16]
7. A polymer solved in a water has a hydrodynamic radius of 15 nm. Calculate the rejection of membrane with a uniform pore radius 0.05 m and 0.1 m for the case of no adsorption at the pore wall and for the case with monolayer adsorption at the pore wall. [16]
8. Calculate the osmotic pressure of the following aqueous solution 3% NaCl(MNacl = 58.45 g/mol) by weight, 3% albumin(Malb 65.000 g/mol) by weight and a suspension containing 30 g/l of a solid (where the particle weight is 1 ng= (10^{-9} g) at a temperature 25 C. [16]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: 07A70808 **R07** **Set No. 1**

IV B.Tech I Semester Examinations,MAY 2011
MEMBRANE TECHNOLOGY
Chemical Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Write brief note on consequences of concentration polarization.
   (b) Discuss fully developed laminar and turbulent velocities in a pipe with diagram. [6+10]
2. (a) List out the industrial applications of micro filtration.
   (b) List out the industrial applications of ultra filtration. [8+8]
3. (a) Write any six physical and chemical properties and give classification based on their separation process.
   (b) Define separation process and explain the sorting demon process. [8+8]
4. Explain how to determine diffusion coefficient by time lag method. [16]
5. Explain and justify:
   (a) Importance of membrane structure.
   (b) Importance of materials used to prepare synthetic membrane. [16]
6. Discuss about hallo fiber module and plate and frame module. [16]
7. Draw and explain the following with diagrams:
   (a) Supported liquid membranes.
   (b) Emulsion liquid membranes. [8+8]
8. Discuss wide angle XRD with graph . [16]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: 07A70808 **R07** **Set No. 3**

IV B.Tech I Semester Examinations,MAY 2011
MEMBRANE TECHNOLOGY
Chemical Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. Discuss briefly about:
   (a) Interactive system.
   (b) Henrys law.
   (c) Diffusion coefficient.
   (d) Flux. [16]
2. Write notes on:
   (a) Plasma etching.
   (b) Archimedes principle. [8+8]
3. Discuss about:
   (a) Importance of spinnerets in tubular membrane.
   (b) Explain the laboratory setup for tubular membrane preparation.
   (c) Write the methods to prepare hallow fiber and capillary membrane. [6+6+4]
4. (a) Write the important parameters of electro dialysis
   (b) Explain separation of amino acids through electro dialysis [8+8]
5. (a) Write a note on modules and process designs.
   (b) Discuss about plate and frame modules with schematic flow path. [6+10]
6. Discuss the following:
   (a) Membrane.
   (b) Membrane process.
   (c) Selectivity.
   (d) Flow. [16]
7. (a) Write the concepts of pervaporation.
   (b) Short note on supported liquid membranes.
   (c) draw and explain schematic drawing of the pervaporation process with a downstream vacuum.
   (d) Write a short note on porous membrane. [16]

8. (a) A 5% solution of sucrose (Mw = 342 g/l) is concentrated using a tubular nano filtration membrane with an internal diameter of 6mm. The membrane shows a complete rejection for sucrose. With a feed solution of 5 wt%, a temperature of 20 C and a pressure of 20 bar, a flux is measured of 33.5 l/m^2.hr at a cross flow velocity of 0.5 m/s while at a velocity 4.5 m/s a flux is measured of 48.9 l/m^2 h. other data density is 103 kg/m^3 η = 1.1*10^{-3} pa.S a= 0.05, b= 1.1 Dsucr = 4.2 *10^{-10} m^2/s.

   (b) Calculate the concentration polarization modules for both flow rates.

   (c) calculate the flux at 10 bar assuming that the concentration polarization. modules remains same. [16]

⋆ ⋆ ⋆ ⋆ ⋆