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GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Seventh Semester – Regular) Examinations, November – 2022
BPECH7010 / BPEPR7010 – MODERN SEPARATION TECHNIQUES
 (Chemical Engineering & PCPR)

Time: 3 hrs

Maximum: 70 Marks

Answer ALL Questions

The figures in the right hand margin indicate marks.

PART – A: (Multiple Choice Questions)

(1 x 10 = 10 Marks)

Q.1. Answer ALL questions

- | | [CO#] | [PO#] |
|----------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------|
| a. In porous membrane, the resistance to mass transfer is determined by: | CO1 | PO1 |
| (i) Total membrane thickness | | |
| (ii) Thickness of support layer | | |
| (iii) Both (i) and (ii) | | |
| (iv) None | | |
| b. Ceramic membrane is a type of: | CO1 | PO1 |
| (i) Polymeric membrane | | |
| (ii) Liquid membrane | | |
| (iii) Inorganic membrane | | |
| (iv) Organic membrane | | |
| c. The term for deposition of solids on the membrane, irreversible during processing is? | CO2 | PO3 |
| (i) feed | | |
| (ii) flux | | |
| (iii) membrane fouling | | |
| (iv) permeate | | |
| d. The selection of membrane does not depend on which property? | CO1 | PO1 |
| (i) Pore size distribution | | |
| (ii) Water permeability | | |
| (iii) perporometry | | |
| (iv) film thickness formed | | |
| e. Name the type of module operation where the flux decrement is higher | CO1 | PO3 |
| (i) dead end flow | | |
| (ii) cross end flow | | |
| (iii) Both (i) and (ii) | | |
| (iv) None | | |
| f. Removal of urea and creatinine from the bloodstream, is major application of which membrane process: | CO1 | PO1 |
| (i) Dialysis | | |
| (ii) Membrane distillation | | |
| (iii) Reverse osmosis | | |
| (iv) Nanofiltration | | |
| g. Separation of azeotropic mixture and heat sensitive products, is widely used application of which the below stated membrane process | CO1 | PO1 |
| (i) Ultrafiltration | | |
| (ii) Reverse Osmosis | | |
| (iii) Membrane bioreactor | | |
| (iv) Pervaporation | | |
| h. How the transport does occur in dense membrane? | CO3 | PO2 |
| (i) microporous | | |
| (ii) macroporous | | |
| (iii) solution diffusion | | |
| (iv) Above all | | |
| i. Why are Bulk Liquid Membrane not widely used in industry? | CO1 | PO1 |
| (i) Due to a small contact area of the membrane with other phases | | |
| (ii) Due to a large contact area of the membrane with other phases | | |
| (iii) No contact area of the membrane with other phases | | |
| (iv) None of the above | | |
| j. In pervaporation process, the permeability of a given component 'i' from a mixture of components 'i' and 'j' can be expressed as a function of: | CO1 | PO3 |
| (i) diffusivity and solubility | | |
| (ii) absurdity and flammability | | |
| (iii) Both (i) and (ii) | | |
| (iv) None of the above | | |

PART – B: (Short Answer Questions)**(2 x 10 = 20 Marks)**Q.2. Answer ALL questions

	[CO#]	[PO#]
a. Define membrane. Give one example of natural and synthetic membrane.	CO1	PO1
b. Define rate governed process.	CO1	PO1
c. Write the advantages of membrane separation process	CO1	PO2
d. What do you mean by Molecular Weight Cut Off? What is its value for UF?	CO1	PO1
e. What are the methods of reducing concentration polarization?	CO1	PO1
f. Differentiate dead end and cross end filtration.	CO3	PO2
g. What are the methods of controlling fouling?	CO3	PO1
h. Why micro filter are employed in dead end filtration mode?	CO1	PO1
i. Write advantage of liquid membrane?	CO1	PO1
j. Differentiate reverse osmosis and nanofiltration.	CO1	PO1

PART – C: (Long Answer Questions)**(10 x 4 = 40 Marks)**Answer ALL questions

	Marks	[CO#]	[PO#]
3. a. Discuss about the area of industrial application of membrane separation process.	5	CO3	PO3
b. Discuss about the preparation of membrane using track-etch method with neat diagram.	5	CO3	PO2
(OR)			
c. What do you mean by membrane module and write its importance?	3	CO1	PO1
d. Explain about the plate and frame membrane module with neat diagram. Write its advantages and disadvantages.	7	CO1	PO1
4. a. Explain about the basic principle and industrial application of Reverse Osmosis	6	CO1	PO1
b. What are the factors affecting performance of Ultrafiltration. Explain briefly.	4	CO2	PO1
(OR)			
c. A countercurrent-flow, plate-and-frame dialyzer is to be sized to process 0.78 m ³ /h of an aqueous solution containing 300 kg/m ³ of H ₂ SO ₄ and smaller amounts of copper and nickel sulphates, using a wash water sweep of 1.0 m ³ /h. It is desired to recover 30% of the acid at 25 ⁰ C. From batch experiments with an acid-resistant vinyl membrane, in the absence of external mass-transfer resistances, a permeance of 0.025 cm/min for the acid and a water-transport number of +1.5 are measured. Membrane transport of copper and nickel sulphates is negligible. Experience with plate-and-frame dialyzers indicates that flow will be laminar and the combined external liquid-film mass-transfer coefficients will be 0.020 cm/min. Determine the membrane area required in m ²	10	CO2	PO2
5. a. Write the basic principle of electrodialysis? Explain its process by drawing a neat diagram.	6	CO1	PO1
b. Explain briefly about the area of application of electrodialysis.	4	CO3	PO1
(OR)			
c. Write short note on ion exchange membrane process.	5	CO1	PO1
d. What is zeta potential? Write its importance in separation process.	5	CO1	PO1
6. a. Describe the basic principle of separation in liquid membrane and write its application.	5	CO3	PO1
b. Mention the advantages and disadvantages of liquid membrane.	5	CO1	PO1
(OR)			
c. What are the factors affecting the performance of gas separation?	5	CO1	PO1
d. What are the areas of application of pervaporation?	5	CO3	PO1

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