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GIET UNIVERSITY, GUNUPUR - 765022
M. Tech. (Third Semester) Examinations, December - 2023
MPECH3014 - Membrane Technologies for Water and Wastewater Treatment
(Chemical Engineering)

Time: 3 hrs

Maximum: 70 Marks

(The figures in the right hand margin indicate marks.)

PART - A**(2 x 10 = 20 Marks)**

Q1. Answer ALL questions	CO#	Blooms Level
a. What is Osmotic Pressure? How osmotic pressure is related to concentration.	CO1	K1
b. Differentiate between Observed retention and Real retention.	CO1	K2
c. Draw a typical molecular cut off curve of a membrane.	CO2	K1
d. Draw the Sharp and diffused molecular cut off curves of a membrane.	CO1	K2
e. Define Membrane Permeability	CO3	K3
f. What is Membrane Casting? What are the Common polymeric membrane materials is used for the casting process.	CO2	K1
g. Differentiate between Homogeneous barrier and Micro porous Barrier.	CO3	K2
h. What are the different types of motion of molecules through barrier?	CO3	K3
i. What is the transport mechanism, Pressure, Pore size, Molecular weight is maintained for Small solute particles to be separated by Reverse Osmosis.	CO4	K2
j. What is the transport mechanism, Pressure, Pore size, Molecular weight is maintained for Red blood cells to be separated by Ultrafiltration.	CO1	K1

PART - B**(10 x 5 = 50 Marks)**

<u>Answer ANY FIVE questions</u>	Marks	CO#	Blooms Level
2. a. Discuss about the Membranes for Gas and Vapor Separation.	3	CO1	K1
b. How Pervaporation and membrane distillation (MD) are distinguished from the other synthetic membrane separation processes with respect to phase change, from liquid to vapor.	7	CO1	K2
3.a. Design the solution diffusion model for RO/NF where the solute flux through the membrane is considered in realistic situation.	6	CO1	K2
b. Demonstrate the Modified solution diffusion model for RO/NF.	4	CO2	K3
4.a Design the Kedem-Katchalsky equation for Ultra Filtration in case of imperfect retention of the solutes by the membrane by a reflection coefficient.	8	CO3	K4
b. Demonstrate the Modified solution diffusion model for Ultra Filtration.	2	CO3	K2
5.a List out the different driving force of transport of species.	3	CO2	K4
b. Enumerate the description of transport process by phenomenological equation.	7	CO2	K3
6. a. Discuss the two main geometries by which Synthetic membranes are fabricated.	3	CO3	K2

b.	Enumerate about the detail steps for Phase Inversion Technique for Preparation of Integrally Skinned Asymmetric Membranes.	7	CO3	K3
7.a.	What is the importance of Membrane modules in advance separation process?	4	CO4	K2
b.	Describe the working mechanism ,design and characteristics of (i) plate and frame module (ii) hollow fiber module (iii) spiral wound and (iv) tubular Modules in order to provide maximum membrane area in relatively smaller volume to get maximum permeate flux.	6	CO4	K3
8. a.	What are the different steps for Preparation of Composite Membranes?	4	CO4	K2
b.	How to modify the membrane surface, aimed at prevention of contaminant deposition and maintenance of high flux.	6	CO4	K4

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