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Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET University)

M.Tech. (First Semester – Regular/ Supplementary) Examination, January – 2026

24MCHPC11002 – Advanced Separation Processes
(Chemical Engg.)

Time: 3 hrs | Maximum: 60 Marks

Answer ALL questions
(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a. Define membrane casting and list the commonly used polymeric materials for membrane fabrication.	CO1	K1
b. Differentiate between a homogeneous (dense) barrier membrane and a microporous barrier membrane	CO2	K1
c. Identify and explain the different modes of molecular transport through membrane barriers.	CO2	K2
d. Explain the transport mechanism involved in reverse osmosis and state the typical operating pressure, pore size range, and molecular weight of small solutes separated by this process	CO3	K1
e. Explain the transport mechanism involved in ultrafiltration and state the operating pressure, pore size range, and molecular size of red blood cells separated by this method.	CO4	K2

PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions	Marks	CO #	Blooms Level
2. a. Explain the significance of membrane modules in advanced separation processes.	5	CO1	K1
b. Describe the working principle, design features, and key characteristics of the membrane modules, with reference to achieving high membrane area per unit volume and enhanced permeate flux.	5	CO2	K2
(OR)			
c. List out the different driving force of transport of species.	5	CO1	K2
d. Enumerate the description of transport process by phenomenological equation.	5	CO2	K2
3.a. Design the solution diffusion model for RO/NF where the solute flux through the membrane is considered in realistic situation.	5	CO2	K2
b. Demonstrate the Modified solution diffusion model for RO/NF.	5	CO3	K3
(OR)			
c. Design the Kedem-Katchalsky equation for Ultra Filtration in case of imperfect retention of the solutes by the membrane by a reflection coefficient.	5	CO3	K4
d. Demonstrate the Modified solution diffusion model for Ultra Filtration.	5	CO2	K3
4.a. Discuss the two main geometries by which Synthetic membranes are fabricated.	5	CO3	K3
b. Enumerate about the detail steps for Phase Inversion Technique for Preparation of Integrally Skinned Asymmetric Membranes.	5	CO3	K4
(OR)			

c.	What are the different steps for Preparation of Composite Membranes?	5	CO3	K3
d.	How to modify the membrane surface, aimed at prevention of contaminant deposition and maintenance of high flux.	5	CO3	K3
5.a.	Discuss about the Membranes for Gas and Vapor Separation.	5	CO4	K3
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.	5	CO5	K3
	(OR)			
c.	Explain the basis of membrane selection considering chemical, mechanical, and operational factors.	5	CO4	K3
d.	Discuss partition coefficient, permeability, and their role in determining membrane efficiency.	5	CO4	K2
6.a.	Evaluate the impact of nanotechnology on surface-based separation processes.	5	CO4	K2
b.	Discuss challenges and future prospects of separation techniques relying on surface properties.	5	CO5	K3
	(OR)			
c.	Describe electrochemical separation techniques for ionic species.	5	CO4	K3
d.	Discuss the importance of ionic separations in water treatment and energy applications.	5	CO5	K2

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