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

B. Tech (Seventh Semester - Regular) Examinations, November – 2025

22BCHPE7010– Modern Separation Technique

(Chemical Engineering)

Time: 3 hrs Maximum: 70 Marks

Answer ALL questions

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

		CO #	Blooms Level
Q.1.	Answer ***ALL*** questions		
a.	Discuss the pressure-driven membrane separation techniques and their applications.	CO1	K1
b.	Compare rate-governed separations with equilibrium-driven separations, giving suitable examples.	CO1	K1
c.	List and explain the merits of membrane-based separations compared to conventional methods	CO2	K2
d.	Describe the working principle of reverse osmosis and explain how membrane selectivity and osmotic pressure influence the process.	CO3	K1
e.	Compare dead-end filtration with cross-flow filtration in terms of operation and performance.	CO4	K2

PART – B **(15 x 4 = 60 Marks)**

	Answer ***all*** the questions	Marks	CO #	Blooms Level
2. a.	Outline and explain two recent developments in separation technology that aim to solve challenges associated with traditional processes. Discuss how they work and their major advantages and applications.	8	CO1	K1
b.	Highlight the key similarities and differences between an old (conventional) and a new (innovative) separation method, focusing on productivity, cost-effectiveness, and environmental footprint.	7	CO1	K2
	(OR)			
c.	Outline the main problems encountered in designing membrane modules for large-scale use. How can these challenges be minimized by appropriate selection of membrane materials and module geometry?	8	CO1	K2
d.	Illustrate and explain the path of fluid through a plate-and-frame module, indicating feed, retentate, and permeate flow channels.	7	CO2	K2
3.a.	Outline the operational principles of the reverse osmosis process and highlight its importance in industrial sectors like water treatment, food processing, and drug formulation.	8	CO2	K2
b.	Identify the important factors determining the operation and performance of an ultrafiltration system. Discuss their roles in affecting flux rate, selectivity, and membrane life.	7	CO3	K3
	(OR)			
c.	Discuss the mechanism of transport through a reverse osmosis membrane based on the solution–diffusion model	8	CO3	K4

d.	Describe the process of determining osmotic pressure in a solution.	7	CO2	K3
4.a.	Explain the fundamental principles of Nano filtration, including the role of membrane structure and selective permeability.	8	CO3	K3
b.	Analyze its industrial applications, and evaluate its advantages and limitations in sectors such as water treatment, pharmaceuticals, and food processing."	7	CO3	K4
	(OR)			
c.	Explain the Resistance Model used to study solvent flux behaviour in Ultrafiltration.	8	CO3	K4
d.	Explain the Gel Polarization Model for solvent flux behaviour in Ultrafiltration	7	CO3	K4
5.a.	Explain the mechanism of ion exchange through membranes during electro dialysis.	8	CO4	K3
b.	Describe in detail the industrial and environmental applications of Electro dialysis.	7	CO4	K3
	(OR)			
c.	Explain the principle of pervaporation and describe how it differs from other membrane separation processes.	8	CO4	K4
d.	Identify the key factors affecting the efficiency of pervaporation, such as membrane selectivity and feed temperature. Analyze how each factor influences the separation performance.	7	CO4	K2

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