

M.E. CHEMICAL ENGINEERING FIRST YEAR SECOND SEMESTER – 2025**MEMBRANE SCIENCE & ENGINEERING**

Time 3hr

Full Marks 100

Answer question no. 1 and any three from the rest

All symbols have their usual meaning

Assume any missing Data

	Q. No 1	Q. No 2	Q. No 3	Q. No 4	Q. No 5	Q. No 6
CO 1	25		10	8		
CO2		15		10		
CO3		10	15		10	
CO4					15	10
CO 5				7		15

1. a) Write the difference of membrane separation process and depth filtration process
b) Discuss the characteristics of homogeneous and asymmetric membrane.
c) Write down application of nanofiltration Membrane.
d) Mention characteristic features of dead end ultrafiltration process.
e) Mention selection criteria for a membrane for fruits processing industries.

5×5=25
2. a) How does size of membrane pore size, pore diameter and pore density are determine?
Explain with appropriate example.
b) What are the main applications of the Microfiltration process? Discuss the permeate flux model of ultrafiltration process.

15+10 = 25
3. a) Discuss the factors affecting rejection profile of protein during ultrafiltration of whey.
c) Mention in brief about theoretical approach to determine molecular weight cut off of a membrane.

15+10= 25
4. a) Briefly mention the steps of membrane casting.

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- b) Write a comparative note on Cellulose triacetate and polysulfone membrane.
- c) A membrane with a surface area of 0.60 m^2 produces a permeate flow rate of 0.25 L/min . Calculate the permeate flux.

8+10+7=25

5. a) Write a comparative note on hollow fiber membrane module and spiral-wound membrane module.
- b) Explain the term concentration polarization and gel layer. Explain effect of gel layer formation on membrane performance.

15+10=25

6. a) Suggest how the extent of fouling be reduced in dead end membrane separation units.
- b) A feed solution of whey protein is to be concentrated from 0.10 (M) to 1.5 (M) by UF at 30°C . The solute rejection is 95% . If the upstream pressure is 5 atm (gauge) and downstream pressure is atmospheric, find out the effective pressure driving force at the start and at the end of the operation. Calculate % reduction of solvent flux at the end of the operation. Take necessary assumptions if any. .

10+15=25