



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS / B.TECH (CHE) / SEM-7 / CHE-704E / 2010-11**

**2010-11**

**ADVANCED SEPARATION PROCESS**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

**GROUP – A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any *ten* of the following :  
 $10 \times 1 = 10$
- i) How does solute rejection change with rise in pressure ?
    - a) Decreases                      b) Increases
    - c) Remain same                d) None of these.
  - ii) Which of the following is not a colligative property ?
    - a) Depression of freezing point
    - b) Osmotic pressure
    - c) Lowering of vapor pressure
    - d) None of these.
  - iii) Solutions having same osmotic pressure are called
    - a) Isotonic solutions            b) Dilute solutions
    - c) Saturated solutions        d) Ideal solutions.





- x) At 'Concentration Polarization' layer, the concentration of bulk solution
- a) increases                      b) decreases
- c) remain same                  d) none of these
- xi) It waste water treatment, membrane separation process is a
- a) Primary treatment      b) Secondary treatment
- c) Tertiary treatment      d) All of these
- xii) In desalination of water, the process used is
- a) Ultra-filtration              b) Micro-filtration
- c) Reverse osmosis            d) Pervaporation.

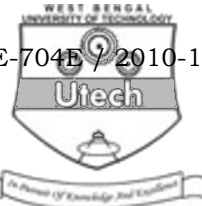
### GROUP – B

#### ( Short Answer Type Questions )

Answer any *three* of the following.                   $3 \times 5 = 15$

2. Why is nanofiltration also known as loose RO ?
3. Deduce equation for mass transport of pervaporation for a pure liquid (ideal case).
4. Write short notes on the following :
 

(i) Membrane module (ii) Isotropic membranes.
5. How do you identify O/W/O or W/O/W emulsion liquid membrane ?
6. What is dialysis ? Name the impurities of blood that can be removed by dialysis.



**GROUP – C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

7. What is liquid membrane ? Explain different types of liquid membrane with example. Derive flux expression for facilitated transport liquid membrane. Give a flow diagram for the emulsion liquid membrane.  $2 + 5 + 5 + 3$
8. What is ultra-filtration ? Explain 'Concentration Polarization' for UF system with a neat sketch. Briefly explain two applications of UF system in industry. What are the limitations of UF system ?  $2 + 5 + 5 + 3$
9. An RO module is to be designed for production of  $1000 \text{ cm}^3/\text{day}$  of portable water containing 200 ppm salt from brackish water containing 34 g salt per litre. An asymmetric cellulose acetate membrane with an inherent salt rejection ability of 98% is to be used. The water permeation coefficient is  $0.035 \text{ m}^3/\text{m}^2 \cdot \text{day} \cdot \text{Atm}$ . The recovery of feed water should be 45% and an operating pressure of 50 atm. gauge is suggested. The permeate side may be assumed to be in atmospheric pressure. If spiral wound modules of  $5 \text{ m}^2$  effective membrane area each is used, how many modules in parallel are required ? The osmotic pressure of 5% brine (linear in salt concentration) is 39.5 atm.  $15$
10. a) What is the advantage of chromatographic separation ?  
 b) What are the applications of gas separation processes ?  
 c) Write down different types of gas separation arrangement.  $5 + 5 + 5$
11. What do you mean by chromatographic separation ? Briefly discuss about the types of chromatography.  $3 + 12$

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