

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-VI (NEW) EXAMINATION – SUMMER 2022****Subject Code:3160507****Date:10/06/2022****Subject Name:Advanced Separation Processes****Time:10:30 AM TO 01:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

- Q.1** (a) Write two examples of materials used as organic membrane and inorganic membrane. **03**
- (b) What are unique properties and solubility behaviour of supercritical fluids? **04**
- (c) With suitable examples discuss importance of advanced separation processes over conventional separation processes in chemical industry. **07**
- Q.2** (a) List out three names of membrane modules used in membrane separation processes. **03**
- (b) Discuss working principle of nanofiltration and its industrial applications. **04**
- (c) Explain with neat flow sheet Residuum Oil Supercritical Extraction (ROSE) process. **07**
- OR**
- (c) Explain with neat flow sheet MTBE manufacturing by catalytic distillation. **07**
- Q.3** (a) Define: Membrane fouling. If the pressure drop ( $\Delta P$ ) is 1000 units, the flux (J) is 50 units, what is the hydraulic membrane permeability? **03**
- (b) Define: supercritical fluid. Explain important properties of super critical fluid. CO<sub>2</sub> is most widely used super critical fluid for extraction-justify. **04**
- (c) Discuss in detail about different types of membrane reactors. **07**
- OR**
- Q.3** (a) Draw labeled diagram of: (i) dead-end membrane filtration and (ii) cross-flow membrane filtration **03**
- (b) State four advantages of reverse osmosis. **04**
- (c) List out five advantages and five limitations of reactive/catalytic distillation over conventional distillation. **07**
- Q.4** (a) Define: (i) equilibrium governed separation and (ii) rate governed separation. **03**
- (b) State four applications of microfiltration. **04**
- (c) Draw a labeled diagram of short path distillation unit (SPDU). **07**
- OR**
- Q.4** (a) Write three examples of concentration driven membrane process. **03**
- (b) What are the essential properties of a good supercritical solvent? **04**
- (c) Discuss membrane gas separator principal using complete mixing model. **07**
- Q.5** (a) Answer the followings: **03**
- (i) What is the membrane that selectively allows certain species to pass through called? **04**
- (ii) What is the value of standard design temperature of reverse osmosis systems? **07**

- (iii) Calculate the recovery for the following data:  
Product Flow:  $535 \text{ m}^3/\text{h}$ .  
Feed flow :  $635 \text{ m}^3/\text{h}$ .
- (b) What is principal and working of thin layer chromatography? **04**
- (c) Explain in detail about pervaporation separation. **07**

**OR**

- Q.5** (a) List out three industrial applications of membrane gas separation. **03**
- (b) With neat diagram explain principle of electrophoresis separation. **04**
- (c) Explain principal and working of gel filtration and affinity chromatography. **07**

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