

22513

11920

3 Hours / 70 Marks

Seat No.

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- Instructions :**
- (1) All Questions are *compulsory*.
 - (2) Answer each next main Question on a new page.
 - (3) Illustrate your answers with neat sketches wherever necessary.
 - (4) Figures to the right indicate full marks.
 - (5) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any FIVE of the following :

10

- (a) Define fouling of membrane.
- (b) Give any two application of nanotechnology.
- (c) State the concept of hydrophilic and hydrophobic membrane.
- (d) Name four membrane distillation separation process.
- (e) State the principle of membrane separation process.
- (f) Define transmembrane pressure and permeate flux.
- (g) Define dead end and cross flow filtration.

2. Attempt any THREE of the following :

12

- (a) Explain submerged membrane bio-reactor with a neat sketch.
- (b) Draw a neat sketch of hollow fibre membrane module.
- (c) Describe the concept of bio-fouling of membrane.
- (d) Explain the principle and working of ultrafiltration membrane process.

- 3. Attempt any THREE of the following : 12**
- (a) Describe the concept of reversible and irreversible fouling of membrane.
 - (b) Describe microfiltration membrane process with a neat sketch.
 - (c) Explain construction and working of air gap membrane distillation.
 - (d) Explain any one example of economic feasibility of study of membrane based separation process.
- 4. Attempt any THREE of the following : 12**
- (a) Describe polymeric and ceramic membrane materials.
 - (b) Describe electrodialysis membrane separation process with a neat sketch.
 - (c) Give any four industrial application of membrane bioreactor.
 - (d) Explain membrane fouling control method. (any one)
 - (e) Explain economic feasibility of membrane separation process for sea-water desalination.
- 5. Attempt any TWO of the following : 12**
- (a) State the principle of reverse osmosis and explain the concept of composite membrane.
 - (b) Differentiate between inorganic and organic nano-particles. (any six points)
 - (c) Give the disadvantages of membrane separation process. (any six points)
- 6. Attempt any TWO of the following : 12**
- (a) Explain the factors which are responsible for membrane fouling. Draw the sketch of fouling of membrane.
 - (b) Give the advantages of membrane separation process over conventional separation process (any six points).
 - (c) Differentiate between reverse osmosis membrane process with ultra-filtration membrane process (any six points).
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