(2½ Hours) **[Total Marks : 60**

N. B. : (1) **All** questions are **compulsory**.
(2) **Figures** to the **right** indicate **full** marks.
(3) Use of log table/non-programmable calculator is allowed.

1. (a) Attempt **any two** of the following: **8**
   (i) What care is to be taken and documentation is to be prepared while transporting hazardous material?
   (ii) Who can apply for patent? Why is it essential ?
   (iii) Enlist the safety precautions to be taken during the storage of highly corrosive material in chemical industry.
   (iv) Explain the term 'Hazardous Code'. Give the symbols of any three hazardous codes.

   (b) State the important instructions to be displayed near the reactor to avoid accidents in a chemical plant. **4**

   OR

   (b) What is ASTM data? How is it relevant with reference to quality testing material? **4**

2. (a) Attempt **any two** of the following: **8**
   (i) What is reverse osmosis? With the help of a neat labelled diagram, explain how is it used to purify brackish water.
   (ii) Explain the desalination process of salty water using electro-dialysis, with special remarks on the membrane used.
   (iii) Describe the Flow Injection Analysis. How is sample transported and detected in this technique?
   (iv) Discuss the advantages of automation in analysis.

   (b) Write a note on "microfiltration". **4**

   OR

   (b) With suitable examples explain ultra-filtration technique. **4**

3. (a) Attempt **any two** of the following: **8**
   (i) What are the advantages of supercritical fluids over organic solvents?
   (ii) Elaborate on designing of green processes with reference to 'Inherent Safer Design' and Process Intensification (PI).

[TURN OVER

Scanned by CamScanner

(iii) Why is CO_2 the most prefered supercritical fluid?

(iv) 'Atom economy helps to reduce the toxicity of the reaction'. Justify this statement with suitable examples.

(b) What is atom economy? How is it calculated? Explain with a suitable example. 4

OR

(b) Describe the advantages of photochemical reactions. 4

4. (a) Attempt **any two** of the following: 8

(i) Describe capillary electrophoresis emphasising on the method of detection.

(ii) Give the classification of nano-materials. Explain the dimensionality of carbon nano wires.

(iii) Explain the details of the flow injection analyzer used in the determination of iron in water.

(iv) What is meant by electro-phoretic and electro-osmotic flow in zone electrophoresis? Describe the basic instrumentation in this technique.

(b) Explain the principle, instrumentation and applications of SDS PAGE technique. 4

OR

(b) Write a note on electro-kinetic chromatography. 4

5. (a) Attempt **any four** of the following: 12

(i) How are certified materials useful in chemical laboratory?

(ii) What is the sequence of documentation for patenting?

(iii) Discuss the application of multilayer film in the determination of potassium in serum sample.

(iv) What are gas monitoring equipments?

(v) Describe the zero waste concept of green chemistry.

(vi) What are ionic liquids?

(vii) Give an account of various supporting media used in electrophoresis.

(viii) How is particle size of nano-materials determined?

Scanned by CamScanner