

(Time: 3 Hours)

Total Marks: 80

N.B.

1. Question No. 1 is Compulsory.
2. Attempt any **Three** Questions from remaining **Five** Questions
3. Assume Suitable Data if needed and Justify the Same
4. Figures to the right indicate full marks.

- Q1 Write short notes or Explain any four of the following [20]
- a) Pressure swing adsorption (PSA) technology.
 - b) Explain working principle of froth flotation.
 - c) Liquid-liquid chromatography.
 - d) Applications of chromatography in separation of enzymes and proteins.
 - e) What are the characteristics of Membrane Processes?
- Q2.a. Explain the principle of HPLC and with the help of schematic diagram discuss various components of HPLC. [10]
- b. What are the various Types of adsorbent? Explain with its characteristics and applications. [10]
- Q3. a. Discuss the any one type of flotation equipment used for waste water treatment [10]
- b. What are the different equipments used for continuous adsorption. Discuss any one of them in detail. [10]
- Q4. a. Discuss the methods of Nano filtration giving details of membranes used, rate equation and industrial applications. [10]
- b. Explain the principle of foam fractionation with any its application in mineral processing. [10]
- Q5.a. Discuss the application of adsorption process in N_2 and O_2 separation from air. [10]
- b. Discuss the phenomenon of foam formation, coalescence, collapse and drainage in details. [10]
- Q6 Write short note on (any four): [20]
- a. Plate and frame module
 - b. Write short note on Microfiltration
 - c. Size exclusion chromatography.
 - d. Thermal swing adsorption
 - e. Affinity chromatography
