① Bioseperation & Downstream Processing Technology-I

(3 Hours) ⑳ [Total Marks: 80]

N.B. 1) Q.No. **1** is **compulsory**.
2) Attempt any **3** questions from Q.No. **2** to **6**.
3) All questions carry **equal** marks

[20]

Q1. Answer the following: (Any 4)
  a. Discuss in detail the physical methods of cell disruption.
  b. Explain the principle of centrifugal separation.
  c. Give a brief account on the stages of Downstream Processing applicable in Bioprocess industries.
  d. Discuss the principles of supercritical fluid extraction.
  e. What is isoelectric precipitation? What are its advantages?

Q2. a. Discuss flocculation and sedimentation [05]
  b. Write a note on the scale-up of centrifugation. [05]
  c. Calculate the specific resistance of the cake (α) and the resistance of the filter medium (r_m) on the basis of the following experimental data for a constant pressure filtration of a suspension of incompressible solids of concentration 30 kg/m³ on a filter medium of area 1 m². The pressure drop was 2 bar. The viscosity of the filtrate (η) is 1.1×10^{-3} kg/m/s. [10]

Vol. of filtrate V(m³)	Time t (sec)
2.0×10^{-3}	23
4.0×10^{-3}	60
6.0×10^{-3}	114
8.0×10^{-3}	184
10.0×10^{-3}	270

Q3. a. What are aqueous biphasic systems? Give examples. How are they useful? [05]
  b. Write a note on absorption factor and stripping factor. [05]
  c. Gas containing 2% by volume solute A is fed to an absorption tower at a rate of 0.35 m³/s at 299K and 106.658 kPa pressure and 95% of original solute is removed by absorbing it in Solvent B. Solvent containing 0.005 mole fraction of solute enters the tower at top and exit liquid stream from absorption tower contains 0.12 mole A per mole B. Find out the flow rate of liquid solvent entering the absorption tower on solute free basis. [10]

[TURN OVER

Q4. a. Explain Reverse micellar extraction. [05]

b. Discuss the operating principle and analysis of single stage batch extractions. [05]

c. An antibiotic exhibits a K value of 10 in organic solvent-water system. If the aqueous feed has 25 mg of the solute [10]
   i. How much could be extracted with an equal volume of organic solvent?
   ii. What percentage of the antibiotic will be extracted if four equal portions of the same volume of organic solvent is used?

Q5. a. Give an account of the action of enzymes in cell disruption. How is the method useful in sequential release of products? [05]

b. What is selective denaturation of proteins? How is it carried out? [10]

c. Explain the characteristics of Fermentation broth. [05]

Q6. a. Outline the mechanism of action of a detergent on the cell wall. [05]

b. Explain the steps involved in large scale precipitation. [10]

c. Explain the effect of temperature and pressure on Binodal Curve. [05]