

Registration No. :

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Total number of printed pages – 2

B. Tech
PCBT 4306

Sixth Semester Regular Examination – 2015

DOWNSTREAM PROCESS ENGINEERING

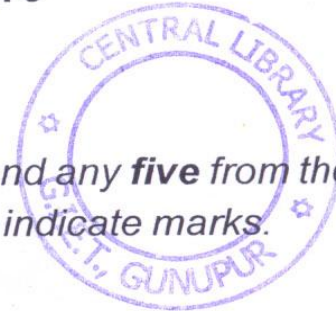
BRANCH : BIOTECH

QUESTION CODE : J 279

Full Marks – 70

Time : 3 Hours

Answer Question No. 1 which is compulsory and any **five** from the rest.
The figures in the right-hand margin indicate marks.



1. Answer the following questions : 2 × 10
- (a) A continuous disc stack centrifuge is operated at 5000 rpm for separation of bakers' yeast. At a feed rate of 60 l min^{-1} , 50% of the cells are recovered. For operation at constant centrifuge speed, solids recovery is inversely proportional to the flow rate. Then calculate at what flow rate is required to achieve 90% cell recovery if the centrifuge speed is maintained at 5000 rpm ?
- (b) Differentiate between salting in and salting out.
- (c) Write the examples of any four enzymes used in cell disruption techniques.
- (d) Write the principle of hydrophobic chromatography.
- (e) Write the principle behind liquid electrophoresis.
- (f) Differentiate between Dialysis and electro dialysis.
- (g) Differentiate between normal phase and reversed phase chromatography.
- (h) Write the principle and application of IMAC.
- (i) A protocol calls for centrifugation at $6000 \times g$. What rpm should be used with an SS-34 rotor (maximum radius of 10.7 cm) to attain this g force ?
- (j) What do you mean by concentration factor δ and the separation factor α ?
2. Write the principle of Drying. What are the different means of drying ? What are the different types of drying equipments used for drying ? Explain the principle and working of Freeze dryer. 2+2+2+4

P.T.O.

3. Discuss the different types of chromatography techniques in details based upon the operation and working principle. Explain the principle of Ion exchange chromatography along with its working with suitable examples. 3+7
4. (a) Write the principle behind crystallization. Add a note on construction and working of Draft tube crystallizer. 5
- (b) An SS-34 rotor has an r_{\min} of 3.27 cm and an r_{\max} of 10.70 cm for a sealed tube containing the maximum allowable volume. If a 120S molecule is to be spun in an aqueous medium at 20,000 rpm at 20°C how long will it take to pellet the molecule? 5
5. (a) What are the different types of cell disruption techniques? Discuss the chemical method of cell disruption with suitable example. 5
- (b) *Leucine dehydrogenase* is recovered from 150 litres of *Bacillus cereus* homogenate using an aqueous two-phase polyethylene glycolsalt system. The homogenate initially contains 3.2 units of enzyme per ml. A polyethylene glycolsalt mixture is added and two phases form. The enzyme partition coefficient is 3.5. 5
- (a) What volume ratio of upper and lower phases must be chosen to achieve 80% recovery of enzyme in a single extraction step?
- (b) If the volume of the lower phase is 100 litres, what is the concentration factor for 80% recovery?
6. (a) Discuss the different techniques employed for precipitation of proteins? 5
- (b) What is HPLC? How it is different from other chromatography techniques? What are the different components of HPLC? 5
7. (a) Write the principle and working of Affinity chromatography. 5
- (b) Write the principle and working of gel filtration. 5
8. Write short notes on any **two** of the following : 5×2
- (a) Aqueous two phase extraction
- (b) Electrodialysis
- (c) Microfiltration
- (d) Theory of filtration.

