B.Tech. (Chemical Engineering) Fifth Semester (C.B.S.)

Biochemical Engineering

P. Pages : 2 **NIR/KW/18/3788**

Time : Three Hours * 1 9 4 3 * Max. Marks : 80

Notes : 1. All questions carry marks as indicated.
2. Solve **any five** Questions.
3. Assume suitable data whenever necessary.
4. Diagrams and chemical equations should be given whenever necessary.
5. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) What is metabolism? Explain pentose phosphate pathway. **8**

b) Describe the salient features of prokaryotic cells. **8**

2. a) What are nucleic acids? Explain their function in a cell. **8**

b) What are proteins? Discuss the methods for purification of proteins. **8**

3. a) The thermal death kinetics data of Bacillus stearothermophilus are as follows at three different temperatures. **8**

Temp ºC	115	120	125
k_d min^{-1}	0.035	0.112	0.347

i) Calculate the activation energy and Arrhenius constant for sterilization.

ii) Find k_d at 140ºC.

b) Explain sterilization of gases/air in detail. **8**

4. a) What is enzyme specificity? Explain the enzyme specificity hypothesis. **8**

b) What is enzyme immobilization? Describe various methods of enzyme immobilization. **8**

5. a) Yeast is being grown in a 48 liter capacity standard aerobic fermenter in a pilot plant experimentation. The fermentation broth is agitated with turbine agitator. The dimensions of the bioreactor and the liquid height in the vessel are as per standard dimensions. Air is being blown into the fermenter at 2 lps. The gas heldup is estimated to be 18%. The turbine impeller is operated with 0.1 hp motor, out of which only 10% of the power is being used for agitating the impeller. Estimate K_La. **10**

b) What is critical oxygen concentration in biochemical reactor? **6**

6. a) Explain the principle, construction and working of Extrusion Rheometer with the help of neat labelled diagram. **8**

b) How will you compute the power requirement for unpassed Newtonian fluids. **8**

7. a) Explain the principle, construction and working of disc stack centrifuge with the help of neat labelled diagram. **8**

b) Explain how the combination of a cell separator unit followed by a provision for recycle of streams containing concentrated cells and CSTR, increases the biomass generation and improves product yield. Derive the necessary expression. **8**

8. Explain **any two** of following. **16**

i) Solid state fermentation.

ii) Industrial uses of Enzymes.

iii) Air lift bioreactor.

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