

**B.E. Food Technology & Biochemical Engineering 3<sup>rd</sup> Year 2<sup>nd</sup>  
Semester Examination 2019**

**Biochemical Engineering-I**

Use separate answer script for each part.

Full Marks: 100

Time: 3 hrs

**Part-I**

**GROUP-A**

1. Write short note (any two) 5×2 = 10
- (a) Physical methods of cell disruption
  - (b) Cloning method
  - (c) Dialysis for enzyme purification
  - (d) Advantages of enzyme immobilization and its three industrial applications

**GROUP B**

Answer any two questions

20×2 = 40

2. (a) Streptomycin is extracted from the fermentation broth using an organic solvent in a counter current staged extraction unit. The distribution coefficient of streptomycin at pH 4 is 40 and the flow rate of the aqueous phase is 150l/min. if only five extraction units are available to reduce the streptomycine concentration from 10g/l in the aqueous phase to 0.2 g/l. determine the required flow rate of organic phase in the extraction unit.
- (b) What are the different types of chromatographic methods? 12+8 = 20
3. (a) Yeast cells are recovered from a fermentation broth by using a tubular centrifuge. Sixty percent (60%) of the cells are recovered at a flow rate of 12 l/min with a rotational speed of 4000 rpm. Recovery is inversely proportional to flow rate.
- (i) To increase the recovery of cells to 90% at the same flow rate what should be the rpm of the centrifuge?
  - (ii) At a constant rpm of 4500 rpm what should be the flow rate to result in 90% cell recovery?

[ Turn over

(b) What is central dogma? Prove that DNA replication is semi conservative process.

14+6 = 20

4. (a) Describe the structure of B type DNA.

(b) Briefly describe the transcription process.

(b) What are the advantages and disadvantages of genetically modified foods.

7+8+5 = 20

## BACHELOR OF ENGINEERING ( F.T.B.E) EXAMINATION, 2019

(3<sup>rd</sup> Year -2<sup>nd</sup> Semester )**Biochemical Engineering-I**

Time: 3 hrs.

Full Marks : 100

## Part-II

[Answer question 1 and any two from the rests, 10 + 2x20 = 50]

1. (a) Why do we require sterilization for fermentation media.
  - (b) Establish the relation between 'survival factor' and temperature of sterilization.
  - (c) State the advantages and disadvantages of continuous sterilization process over batch process for liquid media sterilization.
  - (d) What do you mean by efficiency of a fibrous filter bed ? (2+4+3+1)
2. The thermal death kinetic data of *B. stearothermophilus* are as follows at three different temperatures.

Temp ( <sup>0</sup> C)	115	121	125
k <sub>d</sub> (min <sup>-1</sup> )	0.037	0.115	0.348

Calculate the activation energy , Arrhenius constant for the sterilization and also k<sub>d</sub> at 130<sup>0</sup>C (20)

3. A fermentation system contains an initial spore concentration of  $4.0 \times 10^{10}$ . The medium is sterilized thermally at 121<sup>0</sup>C and the spore density was noted with the progress of time. The data as follows :

Time ( min )	0	5	10	15	20	30
Spore density ( m <sup>-3</sup> )	$5.0 \times 10^{10}$	$4.25 \times 10^9$	$6.1 \times 10^7$	$1.8 \times 10^6$	$4.5 \times 10^4$	35

Find the thermal death kinetics rate constant and also calculate the 'inactivation factor' at 40 min

(20)

[ Turn over

4. The specific death constants of a microbe at heating and cooling period during sterilization of a medium at  $121^{\circ}\text{C}$  are  $0.1 \text{ min}^{-1}$  and  $0.2 \text{ min}^{-1}$ , respectively.  $T_{\text{heating}} = 20 \text{ min}$ ,  $t_{\text{holding}} = 25 \text{ min}$ ,  $t_{\text{cooling}} = 30 \text{ min}$ . The  $D_{10}$  value during holding is  $1.8 \text{ min}$ . the initial batch contained  $8 \times 10^{14}$  organism at  $30^{\circ}\text{C}$ . find the survival factor. (20)
5. Name the different methods of air sterilization and recommend the most effective industrial method with justification. Write the difference between absolute and fibrous type of air filter. State the mechanisms by which microbes are removed from air by fibrous type of air filter. Show how efficiency of a filter can be related to the thickness of the filter bed.

Write short note on (any one) : (a) plate heat exchanger type continuous liquid media sterilization process (b) flash cooling type continuous liquid media sterilization process

( 3 + 3 + 3 + 4 + 7)