B.E (FTBE) 3RD YEAR-2ND SEMESTER 2022

BIOCHEMICAL ENGINEERING- II

Time : Three hours | Full Marks : 100

(50 marks for each Part)
Use seperate answer script foe each Part

Part-I (Full marks 50)

Answer any three of the following questions (3 x 16.5 = 49.5)

(0.5 marks for cleanliness and to-the-point answering)

1. (a) How would you define 'medium'? Describe 'basal' and 'selective' media with example.
   (b) Why do we require medium sterilization as an upstream step?
   (c) Citing proper example explain the basic difference between sterilization and disinfection.
   (d) Mention the factors which influence efficiency of heat sterilization. (2+2.5+3)+2.5+3+3.5

2. (a) Mention the autoclaving condition maintained in the laboratory
   (b) What do you mean by 'Del factor'?
   (c) What are the advantages of continuous sterilization over batch sterilization?
   (d) With a neat sketch show the set up for an indirect steam type continuous sterilization unit using shell-and-tube type heat exchanger. 2.5+3+4+7

3. (a) Destruction of microbes by moist heat is a first-order reaction: show the mathematical relation and draw the related plot mentioning the ordinate and abscissa.
   (b) Write Arrhenius equation mentioning the meaning of each term.
   (c) Draw plot showing the effect of sterilization time and temperature on the Del factor.
   (d) Referring proper example describe 'index/ indicator/ design' microbe.
   (e) A pilot sterilization was carried out in a 1000 dm^3 vessel with a medium containing 10^7 organism per cc , requiring a probability of contamination of '1 in 1000' . Find the Del factor. (2+3)+2+3+3+3.5

4. (a) Filtration sterilization process may also be termed as cold sterilization technique-explain
   (b) What do you mean by 'HEPA Filter'?
   (c) Mention the names of mechanism of arrest of microorganism through fibrous filtration medium
   (d) Write short note on ' Nucleopore membrane'.
   (e) Write the advantages and limitations of filtration sterilization. 3+3+4+3+3.5

Ref. No.: Ex/FTBE/PC/B/T/323/2022

B.E. FOOD TECHNOLOGY AND BIO-CHEMICAL ENGINEERING THIRD YEAR, SECOND SEMESTER EXAM 2022

BIOCHEMICAL ENGINEERING- II

Full Marks: 100 Time: 3 hr

PART:II (50 Marks)

Group A

Answer any two questions **10×2 = 20**

1. Prove that specific growth rate and dilution rate in a CSTR are equal. What are the assumptions taken in this case? What are the design criteria of CSTR? 4+2+4 = 10
2. What is gas hold up? Write its importance in the fermentation process. What are the advantages of a bubble column reactor? 3+4+3 = 10
3. Derive the mass balance equation with respect to cell mass, substrate and product in a CSTR.

Group B

Answer any two questions **15×2 = 30**

4. What are the different types of photobioreactors? What are the major factors affecting photobioreactor efficiency. What are the selection criteria of photobioreactors? 5+5+5 = 15
5. Write the applications of air-lift fermenters. What are the different types of air-lift fermenters? What is the function of gas-liquid separator? What are the different types of gas-liquid separators? 5+5+5 = 15
6. Write the applications of bubble column reactors in bioprocesses. Briefly describe the different flow regimes in the bubble column reactor. Mention liquid phase properties and operating conditions of bubble column reactors. 5+5+5 = 15