

**B.E. FOOD TECHNOLOGY AND BIO-CHEMICAL ENGINEERING THIRD YEAR
SECOND SEMESTER SUPPLEMENTARY EXAM 2023**

BIOCHEMICAL ENGINEERING- II

Part-I

Full Marks: 100

Time: 3 Hrs

GROUP-A

Answer any one question from the following

10×1 = 10

1. Write the applications of photobioreactor. What are the controlling parameters of photobioreactor? 5+5 = 10
2. Briefly describe different criterion of fermenter scale up process. Define dilution rate. 8+2 = 10

GROUP-B

Answer any two questions from the following

20×2 = 40

3. Briefly describe about different types of fermenters with chart. Prove the specific growth rate is equal to dilution rate in a CSTR and mention the assumptions. 12+8 = 20
4. Write a short note on bubble column reactor. Define air holding capacity. Draw schematic diagram for different flow regimes in bubble column reactor. 8+2+10 = 20
5. (i) Consider the scale-up of a fermentation from a 10 L to 10,000 L vessel. The small fermenter has a height to diameter ratio of 3. The impeller diameter is 30% of the tank diameter. Agitator speed is 500 rpm and three Rushton impellers are used. Determine the dimensions of the large fermenter and agitator speed for:
(a) Constant P/V, (b) constant impeller tip velocity (c) constant Reynolds number.
(ii) Write short note on dynamic method for $k_L a$ measurement. 12+8 = 20

[Turn over

Ref. No. : Ex/FTBE/PC/B/T/323/2023(S)

B.E. FOOD TECHNOLOGY AND BIOCHEMICAL ENGINEERING**THIRD YEAR SECOND SEMESTER SUPPLEMENTARY EXAM 2023****Biochemical Engineering II**

Time: 3 hrs.

Full Marks : 100

Part – II[Answer any four questions, $12.5 \times 4 = 50$]

1. With a neat sketch show the components of a CSTR type of fermenter used for aerobic fermentation. Write the basic objectives of using impeller in fermenter . Name different types of impellers. With the help of a neat sketch ,mention the geometric ratios recommended for a standard bioreactor vessel. (4+2.5+2+4)
2. Why baffles are used in fermentation vessel ? Name different types of sparger. Where should a sparger be located in a fermenter? What do you mean by 'vvm' ? What do you mean by 'CIP'? What is the function of condenser used with fermenters? How would you sterilize inlet air for a fermenter having capacity less than 5lit ? (2+2+2.5+1+1+2+2)
3. With the help of neat sketch explain the function of pH controller and foam controller associated with fermenters. Name one anti-foaming agent. (6 +5.5+1)
4. Name two types of DO sensors . What are 'thermistors' and 'RTD'? Write the advantages and disadvantages of air lift bioreactors . (2+(2+2) +6.5)
5. Mention applications of membrane bioreactor . Write short note on : (a) bubble column bioreactor (b) fluidized bed bioreactor (2+ 5.5+5)