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Question Paper Code:U5C02

B.E./B.Tech. DEGREE EXAMINATION, NOV 2024

Fifth Semester

BIO TECHNOLOGY

21UBT502-BIOPROCESS ENGINEERING

(Regulation 2021)

Duration: Three hours

Maximum: 100 Marks

PART A - (10 x 2 = 20 Marks)

1. Write down the mechanisms by which the depth filters act. CO1-U
2. Differentiate Packed bed reactor and Fluidized bed reactor. CO2-App
3. Define Microbial Oxygen Demand. CO1-U
4. If the dissolved oxygen tension is measured as 60% and the solubility of oxygen is $8.0 \times 10^{-3} \text{ Kg/m}^3$. What is the concentration of dissolved oxygen? CO3-App
5. Define Structured model with example CO1-U
6. Yeast cells can use either respiratory pathway and fermentative pathway. Justify. CO2-App
7. List the factors that affect the immobilized enzyme kinetics CO1-U
8. What is Dam Kohler number (Da) and give its importance CO1-U
9. Give the reason why Pichiapastoris is selected as host vector system CO2-App
10. Comment on the factors need to be consider while animal cell cultivation is done CO3-App

PART – B (5 x 16= 80Marks)

11. (a) Derive the equation to find exit age distribution by using pulse input experiment with a neat plots of C curve and E curve. CO2-App (16)

Or

- (b) In a bioreactor, a pulse input of a tracer substance was introduced, and the following concentration data was recorded over time: CO2-App (16)

t (min)	0	10	20	30	40	50	60	70
C (g/L)	0	1	3	6	8	7	4	1

- (i) Calculate the mean residence time of the fluid in the bioreactor.
- (ii) Construct the C-curve based on the given data. Plot the curve on a graph.
- (iii) Tabulate and plot the E-curve using the given data.
12. (a) Explain the different method of determining mass transfer coefficient (kLa) with necessary derivation. CO1-U (16)
- Or
- (b) Explain in detail about the non-fermentative method of kLa determination with neat diagram and model graph. CO1-U (16)
13. (a) Compute the necessary equations for the model for aerobic growth of the Yeast *Saccharomyces cerevisiae*. CO2-App (16)
- Or
- (b) Describe the two-compartment model of bacterial growth with neat block diagram CO2-App (16)
14. (a) Design a fluidized bed reactor for the biocatalyst and explain their advantages over packed bed reactor CO2-App (16)
- Or
- (b) Derive the relationship between the Thiele modulus and effectiveness factor of immobilized enzyme system CO2-App (16)
15. (a) Demonstrate with neat sketch about the cultivation of animal cells in Airlift Bioreactor CO3-App (16)
- Or
- (b) Choose the correct strategy to achieve high cell density cultivation in the reactor system with justifications CO3-App (16)