

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: BTECH
BRANCH: BIOTECH

SEMESTER: 7th
SESSION: MO/2024

SUBJECT: BE402 BIOREACTOR AND BIOPROCESS DESIGN

TIME: 2 HOURS

FULL MARKS: 25

INSTRUCTIONS:

1. The total marks of the questions are 25.
 2. Candidates attempt for all 25 marks.
 3. Before attempting the question paper, be sure that you have got the correct question paper.
 4. The missing data, if any, may be assumed suitably.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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|------------------------------------|---|-----|-----------|-----------|
| Q1 | (a) Draw a neat diagram of a typical bioreactor with labeling all parts. | [5] | CO
CO1 | BL
BL2 |
| Q2 | (a) An organism is used in chemostat culture in a 60 m ³ fermenter. The feed contains 12 g/L glucose and μ_{\max} and K_s of the organism is 0.3 h ⁻¹ and 0.2 g/L respectively. What flow rate is required for steady state substrate concentration to reach 1.5 g/L? What will be the cell density at that flow rate? $Y_{x/s} = 0.06$ g/g | [5] | CO1 | BL4 |
| Q3 | A specific enzyme acts as catalyst in the fermentation of reactant A. At a given enzyme concentration in the aqueous feed stream (25 litter/min) find the volume of plug flow reactor needed for 95% conversion of reactant A ($C_{A0} = 2$ mol/L). The kinetics of the fermentation at this enzyme concentration is given by | [5] | CO2 | BL5 |
| $-r_A = \frac{0.1C_A}{1 + 0.5C_A}$ | | | | |
| Q4 | (a) Why scale down approach is employed? | [2] | CO3 | BL2 |
| Q4 | (b) Describe the dynamic gassing out methods of determination of K_La for aerobic fermentation. | [3] | CO1 | BL3 |
| Q5 | (a) Derive the performance equation of an ideal batch reactor. Why it is same as PFR? | [5] | CO2 | BL3 |

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