

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

CLASS: B.TECH
BRANCH: BIOTECHNOLOGY

SEMESTER : VI
SESSION : SP/2023

SUBJECT: BE308 BIO SEPARATION ENGINEERING

TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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|----|--|------|-----|-----|
| Q1 | (a) Explain sonication and write its applications. | [5] | CO1 | BL2 |
| Q1 | (b) Compare between isopycnic and rate zonal gradient centrifugations. | [5] | CO1 | BL3 |
| Q2 | (a) Explain the Aqueous Two-Phase Extraction (ATPE) briefly. | [5] | CO2 | BL2 |
| Q2 | (b) 100 L of solution contains 10 g/L BSA and some contaminant of 5 g/L. Calculate the salt required to recover 90% of BSA if the value of B and k for BSA are 21.6 and 7.65, respectively, and that of contaminant are 20 and 7, respectively. What will be the purity of the lipase at 90% recovery? | [5] | CO2 | BL4 |
| Q3 | (a) With a suitable diagram, distinguish between dead-end and cross-flow modes of filtration. | [5] | CO3 | BL3 |
| Q3 | (b) A protein solution (4.4 g/L) is UF using a membrane module that completely retains the protein. At a certain trans-membrane pressure, $J = 1.3 \times 10^{-5}$ m/s; $D = 9.5 \times 10^{-11}$ m ² /s; $C_m = 10$ g/L. Calculate membrane thickness if J is increased to 2.6×10^{-5} m/s. What will be the new C_m ? | [5] | CO3 | BL5 |
| Q4 | A protein is to be purified using ion-exchange column chromatography. The relationship between HETP (Height Equivalent to Theoretical Plate) and the linear liquid velocity of the mobile phase is given by $H = \frac{A}{u} + Bu + C$, where H is HETP (m), and u is the linear fluid velocity of the mobile phase (m/s). A , B , and C values are 3×10^{-8} m ² /s, 3 s, and 6×10^{-5} m, respectively. What will be the number of theoretical plates based on the minimum HETP for a column of 66 cm in length? | [10] | CO4 | BL5 |
| Q5 | (a) Draw and explain a typical drying rate curve with proper notations. | [5] | CO5 | BL2 |
| Q5 | (b) To dry a solid, 7 hrs are required to reduce the moisture content from 31% to 6%. The critical moisture content is 20%. Assuming a falling rate period, calculate the time required to reduce the moisture content of the same solid from 31% to 1% under the same conditions. | [5] | CO5 | BL3 |

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