Code: 9A23502

R09

B.Tech III Year I Semester (R09) Supplementary Examinations, May 2013

BIOCHEMICAL REACTION ENGINEERING - I

(Biotechnology)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) Differentiate between elementary and non-elementary reactions.
(b) Differentiate between order and molecularity of reactions.
(c) The rate constant of a reaction at 27°C is 1.3 x $10^{-3}s^{-1}$. Determine the frequency factor. Take E = 128170 cal/mol.

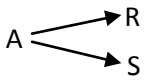
2 Using integral method of analysis show that A+B→ product follows second order reaction. Assuming C_{A0},C_{B0} initial concentrations of A and B respectively, M = C_{B0}/ C_{A0}, initial molar ratio of reactants, C_A and C_B are concentrations of A and B at any time t.

3 Develop the performance equation of a PFR.

4 (a) Explain how the parameters are estimated in Monod's equation.
(b) Explain how sterilization is done in continuous mode.

5 Explain in detail about:
(a) Substrate inhibition kinetics.
(b) Product inhibition kinetics.

6 Liquid reactant A decomposes as per the following reaction scheme:



With rates: $r_R = K_1 C_A^2,\ K_1 = 0.4\ m^3/(mol.min)$

$r_S = K_2 C_A,\ K_2 = 2(\text{min})^{-1}$.

An aqueous feed containing A with $C_{A0} = 40\ mol/m^3$ enters a reactor, decomposes, and a mixture of A, R, S leave the reactor. Find the operating conditions ($X_A, \tau\ and\ C_R$) which maximizes C_R in a mixed flow reactor.

7 Show that for non-adiabatic operation:

$$X_A = \frac{C_P \Delta T - Q}{-\Delta HR}.$$

8 Explain in detail about the following:
(a) Dispersion model.
(b) Tanks-in-series model.

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