

Code: 9A23502

R9

## B.TECH III Year I Semester (R09) Supplementary Examinations, May 2012 BIOCHEMICAL REACTION ENGINEERING - I

(Biotechnology)

Time: 3 hours

## Max Marks: 70

## Answer any FIVE questions All questions carry equal marks

- 1 (a) Explain the concept of molecularity and order of reaction.
  - (b) A certain reaction has a rate given by  $-r_A = 0.005C_A^2$  mol/cm<sup>3</sup>.min. If the concentration is to be expressed in mol/liter and time in hours, what would be the value and unit of the rate constant?
  - (c) The pyrolysis of ethane proceeds with an activation energy of about 300 kJ/mol. How much faster is the decomposition at 650°C than at 500°C.
- 2 For the reaction  $A \rightarrow R$ , second order kinetics and  $C_{AO}=1$  mol/liter, we get 50% conversion after 1 hour in a batch reactor. What will be the conversion and concentration of A after 1 hour if  $C_{AO} = 10$  mol/liter?
- 3 (a) Derive the performance equation of a PFR.

 $C_{Af} = 330 \text{ m mol/liter}?$ 

(b) A stream of pure gaseous reactant A (C<sub>to</sub> = 660m mol/liter) enters a plug flow reactor at a flow rate of F<sub>AO</sub> = 540 m mol/min and polymerizes there as follows.
3A→R, -r<sub>A</sub> = 54 m mol/(liter.min)
How large a reactor is needed to lower the concentration of A in the eject stream to

4 Discuss about death kinetics involved in batch and continuous sterilization.

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- 5 Write about effect of inhibitors and models for inhibition kinetics.
- 6 Under appropriate conditions A decomposes as follows.

A 
$$\xrightarrow{K_1 = 0.1/\text{min}}$$
 R  $\xrightarrow{K_2 = 0.1/\text{min}}$  S

R is to be produced from 1000 liter/hr of feed in which  $C_{AO} = 1$  mol/liter,  $C_{RO} = C_{So} = 0$ 

- (a) What size of plug flow reactor will maximize the concentration of R, and what is that concentration in the effluent stream from this reactor?
- (b) What size of mixed flow reactor will maximize the concentration of R, and what is  $C_{R,max}$  in the effluent stream from the reactor?
- 7 Derive the energy balance equation for a PFR under nonisothermal conditions.
- 8 (a) What are the reasons for non ideality?
  - (b) Obtain the RTD function of an ideal CSTR.
  - (c) Discuss briefly about tanks-in-series model.

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