R07

III B.Tech I Semester Examinations, May 2011 **BIOCHEMICAL REACTION ENGINEERING-1 Bio-Technology**

Time: 3 hours

Code No: 07A52302

Max Marks: 80

Answer any FIVE Questions All Questions carry equal marks ****

- 1. Describe about online data analysis for measurement of biochemical parameters.
- 2. Explain which type of reactor would you choose for series reaction scheme A $k_1 R$ k_2 S, for different combinations of k_1 and k_2 [16]
- 3. Write short notes on
 - (a) microencapsulation
 - (b) covalent attachment
 - (c) Adsorption

[5+5+6]

[16]

[16]

- 4. Assume that for an enzyme immobilized on the surface of a non porous support material the external mass transfer resistance for substrate is not negligible as compared to the reaction rate. The enzyme is subjected to substrate inhibition $v = V_m[S] / K, m + [S] + [S]^2 / K_{s1}$
 - (a) Are multiple states possible? Why or why not?
 - (b) Could the effectiveness factor be greater than one? [8+8]
- 5. Michaelis-Menton kinetics are used to describe intracellular reactions. Yet $[E_0] \approx$ $[S_0]$. In invitro batch reactors, the quasi steady state hypothesis does not hold for $[E_0] \approx [S_0]$. The rapid equilibrium assumption will not hold. Explain why Michalis-Menten kinetics and the quasi-steady-state approximation are still reasonable descriptions of intracellular enzyme reactions. [16]
- 6. Derive the design equations for plug flow reactor.
- 7. (a) Explain about various variables affecting the rate of biochemical reaction.
 - (b) Describe various methods of expressing rate of a biochemical reaction. [8+8]
- 8. Given that the maximum specific growth rate of an organism is $\mu_{max} = 1$ h-1 and its Ks = 1.5 g/cm³. If the input substrate concentration is 145 g/cm³ and concentration of biomass at this maximum output is 50 g/ cm^3 , determine the cell mass formation rate at the maximum output rate. [16]

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- 1. Define V (maximum velocity), KmA, KmB for a two substrate reaction and explain how one will evaluate the true kinetic parameters. [16]
- 2. Explain the convective mass transfer coefficient kc in immobilized enzyme systems.
- 3. Describe about offline data analysis for measurement of biochemical parameters.

4. Establish relation ship between the equilibrium constant and its relation to G^{0} .[16]

- 5. Milk is pasteurized if it is heated to 63° C for 30 min, but if it is heated to 74° C it only needs 15 s for the same result. Find the activation energy of this sterilization process? 16
- 6. (a) What is the role of pH and Temperature on substrate inhibition?
 - (b) What is the role of pH and Temperature on product inhibition? [8+8]
- 7. Explain the following
 - (a) cofactor regeneration
 - (b) multienzyme systems [8+8]
- 8. (a) Why do we use the specific growth rate to describe cell growth instead of the doubling line? Explain in detail.
 - (b) What are the various criteria for selection of a bio reactor? [8+8]

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1.	Explain about overall growth stoichiometry of fermentation.	[16]
2.	Explain various models for inhibition kinetics?	[16]
3.	Describe the effect of non-control of temperature for an exothermic reaction CSTR.	in a [16]
4.	Write short notes on	
	(a) ESTIMATION OF Km, AND Vmax	
	(b) Substrate Effects on enzyme catalized reactions	
	(c) Multiple-Substrate Inhibition [5+	-5+6]
5.	Derive the design equation for a batch reactor. Write the advantages and	
	disadvantages using batch reactors in bioprocessing?	[16]
6.	Explain about the Kinetic Models for non-elementary biochemical reaction?	[16]
7.	Discuss about diffusion effects in surface bound enzymes on porous support	
	material.	[16]
8.	Discuss about the interactions and carriers used for enzyme immobilization	n by
	adsorption.	[16]

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