Registration No. : | | | | | | | | | | |

Total number of printed pages – 2

B. Tech

PEBT 5304

Fifth Semester Regular Examination – 2014

BIOCHEMICAL REACTION ENGINEERING

BRANCH : BIOTECH

QUESTION CODE : H 185

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*
The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10

   (a) What is psychometric chart ? Write any two applications of psychometric chart.

   (b) What are the limitations of Monod's model ?

   (c) Differentiate between the integral and differential methods for analyzing kinetic Data.

   (d) What are the characteristic features of Ideal reactor ?

   (e) What is adiabatic flame temperature ?

   (f) What is Arrhenius' Law ?

   (g) On doubling the concentration of reactant, the rate of reaction triples. Find the reaction order.

   (h) Find the value of ε_A for a reaction $A + 3B \rightarrow 6R$.

   (i) Differentiate between space time and space velocity.

   (j) Differentiate between order and molecularity of a reaction with example.

2. Write the integral method of analysis for a constant volume batch reactor operating in 1st and 2nd order reaction conditions respectively. 10

3. Derive an expression for the concentration profile inside the porous catalyst considering cylindrical pore and 1st order kinetics. 10

P.T.O.

4. (a) Derive the Michaelis-Menten equation. 5

(b) During the growth of Saccharomyces cerevisiae on glucose in a 20 l fermenter, the following data were observed on glucose concentration (s) and the specific growth rate (μ). Calculate the μ_m and K_s. 5

(s), g/l	10	5	3.3	2.25	2.0	1.7	1.4
(μ), h^{-1}	0.4	0.36	0.3	0.27	0.25	0.22	0.2

5. (a) 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 ? 5

(b) For the stoichiometry A + B → (products) find the reaction orders with respect to A and B. 5

C_A	2	2	3
C_B	125	64	64
$-r_A$	50	32	48

6. (a) An aqueous feed of A and B (400 liter/min, 100 mmol A/liter, 200 mmol B/liter) is to be converted to product in a plug flow reactor. The kinetics of the reaction is represented by $A + B \rightarrow R, -r_A = 200\, C_A C_B \frac{\text{mol}}{\text{liter}\cdot\text{min}}$. 5

(b) Write the construction, working, advantages and disadvantages of fluidized bed catalytic reactor. 5

7. (a) A gaseous feed of pure A (1 mol/liter) enters a mixed flow reactor (2 liters) and reacts as follows : $2A \rightarrow R, -r_A = 0.05\, C_A^2 \frac{\text{mol}}{\text{liter}\cdot\text{sec}}$. 5

(b) What are the different types of enzyme inhibition ? Derive the kinetic expression for competitive inhibition. 5

8. Write short notes on any two : 5×2

(a) Recycle reactor

(b) Autocatalytic reaction

(c) Briggs-Haldane relationship

(d) Monod's model of growth kinetics.