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

Total number of printed pages – 2

B. Tech

PEBT 5304

Fifth Semester (Back/Special) Examination – 2013

BIOCHEMICAL REACTION ENGINEERING

BRANCH : BIOTECH

QUESTION CODE : D321

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 queations : 2×10
   (a) Difine space time and space velocity.
   (b) Write the difference between order and molecularity of reactions.
   (c) Write the difference between homogeneous and heterogeneous reactions.
   (d) What are the advantages of fluidized bed reactors over packed bed reactors ?
   (e) What do you mean by psychometric chart ? Write the use of psychometric chart.
   (f) Write the conditions where Monod's growth model is not applicable.
   (g) What is critical dilution rate ? What happens to specific growth rate at critical dilution ?
   (h) On doubling the concentration of reactant, the rate of reaction triples. Find the reaction order.
   (i) Consider an isothermal gas-phase reaction A□2R. Calculate $□_A$ of the reaction.
   (j) What do you mean by performance equation ?
2. (a) Derive an expression for velocity of an enzyme catalyzed reaction under "competitive inhibition". 5
   (b) Write short note on Monod's model of growth kinetics. 5
3. (a) Derive the performance equation of a PFR operating condition in ideal. 5
   (b) Derive the performance equation for reactor containing porous catalyst particle. 5
4. Discuss, in detail, the integral method of data analysis for irreversible unimolecular-type first order and biomolecular second order reaction for a varying volume batch reactor. 10

P.T.O.

5. (a) From a series of batch runs with a constant enzyme concentration, the following initial rate data were obtained as a function of initial substrate concentration. Evaluate the Michaelis-Menten kinetic parameters by employing the Langmuir plot, the Linewaver-Burk plot, and the Eadie-Hofstee plot. 10

The following data were generated :

S_0 (nM/L)	V_0 (mM/L min)
1	0.2
2	0.22
3	0.3
5	0.45
7	0.41
10	0.5
15	0.4
20	0.33

6. (a) Write short note on PFR in series and parallel arrangement.

(b) 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

$A + B \rightarrow R, \qquad -r_A = 200 C_A C_B \text{ mol/liter .min}$

Find the volume of reactor needed for 99.9% conversion of A to product. 5

7. (a) Derive the equation for analysis of data by integral method for a zero order reaction operating in constant volume batch reactor. 5

(b) Milk is pasteurized if it is heated to 63°C for 30 min, but if it is heated to 74°C it only needs 15s for the same result. Find the activation energy of this sterilization process. 5

8. Answer any **two** of the following : 5×2

(a) Write a short note on autocatalytic reaction.

(b) Derive the equation for Michaelis-Menten kinetics.

(c) Derive the expression for Recycle reactor.

(d) Write short note on Briggs-Haldane relationship.