USN | | | | | | | | | | 15BT51

Fifth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Bio-kinetics and Bio-reaction Engineering

Time: 3 hrs.   Max. Marks: 80

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1   a. Define the following : i) Order and molecularity of a reaction   ii)   Arrhenius law
        iii) Collision theory   iv) Activated complex theory.   **(08 Marks)**
    b. Milk is pasteurized, if it is heated to 63^0C for 30 min, but if is it heated to 74^0C it only needs
        15 sec, for the same result. Find the activation energy of this sterilization process. **(08 Marks)**

OR

2   a. Explain differential method of analysis of batch reactor data.   **(08 Marks)**
    b. Find order and rate constant for the following reaction.
        $ATP \xrightarrow{K} ADP + Energy$ **(08 Marks)**

r_A moles/ lit min	8.62×10^{-4}	1.75×10^{-3}	2.9×10^{-3}	4.4×10^{-3}	5.1×10^{-3}
C_A , moles/lit	0.0125	0.0175	0.0225	0.0275	0.030

Module-2

3   a. Derive the design equation of CSTR.   **(10 Marks)**
    b. At   room   temperature   sucrose   is   hydrolysed   by   catalytic   action   of
        Sucrose $\xrightarrow{Sucrase}$ product, starting with sucrose concentration 2 moles/lit and feed rate 25
        lit/min. The kinetics of reaction is given by $-r_A = \dfrac{100C_A}{1 + 0.50C_A}$ m moles/lit.min. Find the
        volume of the reactor to achieve a conversion of 95% in MFR.   **(06 Marks)**

OR

4   a. Derive the Performance equation of PFR.   **(10 Marks)**
    b. A homogenous liquid phase reaction $A \rightarrow S$, $-r_A = KC^2_A$ takes place with 50% conversion
        in a PFR. What will be the conversion, if the original reactor is replaced by a PFR 6 times
        the volume of PFR?   **(06 Marks)**

Module-3

5   a. Explain the reasons for Non – Ideality in bioreactors.   **(06 Marks)**
    b. The concentration readings in the table represents a continuous response to a delta function
        (pulse input) in to a reactor, find average time and tabulate E Vs t plot (exit age distribution).
                                                                                (10 Marks)

Time 't' in min	0	5	10	15	20	25	30	35
Tracer input concentration – in g/ℓ of fluid	0	3	5	5	4	2	1	0

OR

6   a. Sketch F, C and E curves. Derive relation between them.   **(08 Marks)**
    b. With RTD experiment, explain how to determine conversion X_A in reactor. **(08 Marks)**

Module-4

7 a. Derive Michaleis – Menten equation. (10 Marks)
   b. Explain Non – competitive inhibition. (06 Marks)

OR

8 a. Explain how do evaluate Michaleis – Menten constants Vm and Km. (08 Marks)
   b. Explain the terms : i) Co – factor   ii) Apoenzyme   iii) Co – enzyme   iv) Enzyme activity. (08 Marks)

Module-5

9 a. Explain Monod Model, how do you evaluate μ_m and K_s. (10 Marks)
   b. Write short notes on growth of filamentous organisms. (06 Marks)

OR

10 a. Write critical notes on different types of sterilization. (08 Marks)
    b. Explain Death kinetics of Microorganisms. (08 Marks)

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