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10BT52

Fifth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Biokinetics & Bioreaction Engineering

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting
at least TWO questions from each part.**

PART – A

- 1 a. State and explain the temperature dependency of rate and rate constant of a reaction by Arrhenius law and collision theory. (14 Marks)
b. In case of a first order reaction, show that the time required for 75% conversion is double the time required for 50% conversion. (06 Marks)
- 2 a. Obtain the kinetic rate expression for irreversible biomolecular reaction, whose initial Molar concentration of reactants is $r = \frac{CB_o}{CA_o}$. (12 Marks)
b. Discuss the effect of temperature and pressure on equilibrium constant of the reaction. (08 Marks)
- 3 a. Obtain the performance equation for Batch and Plug flow reactors, along with graphical representation. (10 Marks)
b. Certain reaction was carried out in CSTR whose volume is 2 lits. The volumetric flow rate of the system is 0.5 lit/sec. The reactor was operated to achieve 60% of conversion with the initial feed concentration was 0.1 mol/lit to 0.9 mol/lits. Find the general kinetic rate expression for reaction $A \rightarrow R$. (10 Marks)
- 4 a. Explain the various reasons for cause of non ideality in the reactor system with the neat sketch. (10 Marks)
b. State and explain the co-relation that exists between C, E, F curves. (10 Marks)

PART – B

- 5 a. Explain the kinetic mechanism of temperature inhibition with suitable reaction mechanism. (10 Marks)
b. Derive the expressions for line weaver burk plot and Eadie-Hofstee plots for estimating K_m and V_{max} . Also explain the significance of K_m and V_{max} . (10 Marks)
- 6 a. State and explain the concept of heat evolution in microbial culture. (05 Marks)
b. Assume that experimental measurement for a certain organism have shown that cell can convert $\frac{2}{3}$ (wt/wt) of substrate carbon to biomass. Calculate stichometric co-efficient for following biological reactions. Also find $\frac{YX}{S}$ for both reactions,
Hexadecane : $C_{16}H_{34} + aO_2 + bNH_3 \rightarrow c[C_{4.4}H_{7.3}N_{0.86}O_{1.2}] + dH_2O + eCO_2$
Glucose : $C_6H_{12}O_6 + aO_2 + bNH_3 \rightarrow c[C_{4.4}H_{7.3}N_{0.86}O_{1.2}] + dH_2O + eCO_2$ (15 Marks)
- 7 a. Explain the various stages of cell growth in a typical batch culture. (10 Marks)
b. Write a brief note on Monod model and growth of filamentous organism. (10 Marks)
- 8 a. Explain the role of fermentation media in the process of fermentation. (10 Marks)
b. Explain the operational procedure for batch and continuous sterilization. (10 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.