**R07** 

# Set No. 2

# III B.Tech II Semester Examinations, APRIL 2011 BIOCHEMICAL ENGINEERING Chemical Engineering

Time: 3 hours

Code No: 07A60805

Max Marks: 80

[16]

[16]

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

- 1. Write the theory of sedimentation with neat diagram and mathematical equations?
- 2. Give importance of the following and explain
  - (a) Endoplasmic reticulum
  - (b) Mitochondria
  - (c) Nucleus .
- 3. . "Fed batch culture as the paradigm for many efficient microbial processes" Justify it ? [16]
- 4. Write short notes on nthe following k La measurement techniques
  - (a) Static method
  - (b) Dynamic method. [8+8]
- 5. Define and explain the terms
  - (a) Turnover number
  - (b) Michaelis menten constants. [8+8]
- 6. Define Batch Growth? Explain about the growth patterns and Kinetics in Batch culture? [16]
- 7. 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  $v = V_m[S]/K'_m + [S] + [S]^2/K_s 1$ 
  - (a) Are multiple states possible? Why or why not?
  - (b) Could the effectiveness factor be greater than one? [8+8]
- 8. Define the yield coefficient and explain its significance in the growth of cells by substrate utilization .The following is the stoichiometric equation for combustion of cell pseudomonas growing in glucose medium.  $CH_{1.66}N_{0.2}O_{0.27} + 1.28O_2 \rightarrow CO_2 + 0.1N_2 + 0.83H_20$  Assuming the heat of combustion of 104 kcal per mole of O2 calculate the heat released by combustion of bacteria. [16]

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**R07** 

Set No. 4

## III B.Tech II Semester Examinations, APRIL 2011 BIOCHEMICAL ENGINEERING Chemical Engineering

Time: 3 hours

Code No: 07A60805

Max Marks: 80

[8+8]

[16]

[8+8]

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

- 1. Write short notes on:
  - (a) Enzymatic cell lysis
  - (b) Chemical cell lysis.
- 2. Explain the process of DNA replication with a neat diagram.
- 3. Explain the mechanism involved in using Immobilized enzymes for the regeneration of cofactors. [16]
- 4. Write short notes on
  - (a) Yield factor
  - (b) ATP coupling.

5. Write short notes on

- (a) ENZYME CATALYSIS
- (b) Nature and Examples of Enzyme Catalysis. [8+8]
- 6. What are the types of structured kinetic models? Explain. [16]
- 7. Derive suitable expressions for estimating effluent substrate and cell mass concentration in an ideal PFR using Monod kinetics. [16]
- 8. (a) Explain briefly how you would calculate the oxygen mass transfer coefficient, kLa, using the dynamic gassing out method.
  - (b) Using a rough sketch of the relationship between shear stress and shear rate, describe briefly the time-independent rheological models that might be used to characterise the rheological behaviour of fermentation broths. [8+8]

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**R07** 

Set No. 1

## **III B.Tech II Semester Examinations, APRIL 2011 BIOCHEMICAL ENGINEERING Chemical Engineering**

Time: 3 hours

Code No: 07A60805

Max Marks: 80

[16]

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

- 1. Write a note on Enzyme coenzyme reactors.
- 2. Write down the chemical structure of two isomeric forms of amino acids. what are the properties of amino acids? 16
- 3. Define dilution rate and yield coefficient based on biomass in a CSTR and establish that  $D = F/V_R$ . 16
- 4. Explain in detail about the batch sedimentation with neat diagrams? [16]
- 5. Discuss in detail the major elements of metabolism of E.Coli. [16]
- 6. Write short notes on
  - (a) MODELS OF ENZYME KINETICS
  - (b) INHIBITION AND ACTIVATION IN ENZYME REACTIONS. [8+8]
- 7. Yeast is being grown in a 48 ltr capacity standard aerobic fermenter in a pilot plant experimentation. The fermentation broth is agitated with a turbine impeller. The dimensions of the bio reactor and the liquid height in the vessel is as per standard dimensions. Air is being blown into the fermenter at the rate of 12 lpm. The gas hold-up is estimated to be 18%. The turbine impeller is operated with 0.1 HP motor, out of which only 10% of the power is being used for agitating the impeller. Estimate the mass transfer rate ( $K_La$ ). [16]
- 8. (a) Discuss about continuous sterilization of media with neat schematic diagrams.
  - (b) Mention the advantages and drawbacks of continuous sterilization. [8+8]

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**R07** 

# Set No. 3

# III B.Tech II Semester Examinations, APRIL 2011 BIOCHEMICAL ENGINEERING Chemical Engineering

Time: 3 hours

Code No: 07A60805

Max Marks: 80

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

- 1. Suppose you have micro organism that obeys Monod equation where  $\mu_{max} = 0.7 \text{ Hr}^{-1}$  and  $\text{K}_s=5$  g/l. The cell yield (YX/S) is 0.65. You want to cultivate this microorganism in one CSTR. The flow rate and the substrate concentration of the inlet stream should be 5000L/h and 85 g/l, respectively. The substrate concentration of the outlet stream must be 5g/l. what should be the size of the fermenter. What is the cell concentration of the outlet stream? [16]
- 2. (a) Discuss the theoretical principles of constant pressure filtration.
  - (b) How is compressibility of a cake determined? [8+8]
- 3. Explain the design and operation of Fed-batch reactor with mass-balances ? [16]
- 4. Discuss in detail the EMP Pathway related to TCA with respect to energy utilization. [16]

5. Describe in detail about k La measurement techniques. [16]

- 6. Write short notes on
  - (a) Entrapment
  - (b) Surface immobilization. [8+8]
- Derive Michaelis-Menten equation. State the importance of MM constant. How Koshland-/nemethy-Filmer (KNF) model account for allosteric regulation. [16]
- 8. (a) Write about the different factors which determine the different levels of protein structure.
  - (b) Amino acids are the building blocks of proteins. Explain briefly. [8+8]

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