Code No: R05320804 **Set No. 1**

III B.Tech II Semester Regular Examinations, Apr/May 2008
BIO CHEMICAL ENGINEERING
(Chemical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) State the cell theory proposed by Schleiden and Schwann. What is its importance?
   (b) Give an account of molds and yeasts. [6+10]

2. Define non-competitive inhibition and calculate the concentration of a non competitive inhibitor needed to yield a 90% inhibition of an enzyme catalyzed reaction? (where $K_i = 2.9 \times 10^{-4}$ M) [16]

3. (a) Name at least two natural supports and two synthetic supports used for immobilization by covalent attachment.
   (b) Describe the methods of physical entrapment by poly acrylamide gel and microencapsulation. [4+12]

4. (a) Give the advantages and disadvantages of CSTR over batch reactor for measuring cell growth kinetics.
   (b) Suppose you have a microorganism that obeys the Monod equation, where $\mu_{max} = 0.7$ hr¹ and $K_s = 5$g/L. The cell yield ($Y_{X/S}$) 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 500L/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?

   [8+8]

5. Give a detailed account of carbohydrates with suitable examples. [16]

6. (a) Describe the various configurations of CSTRs used for enzyme-catalyzed reactions.
   (b) Derive the general substrate balance equation for the single enzyme catalyzed reaction S→P taking place in a CSTR. [10+6]

7. (a) With the help of schematic diagram explain the steps involved in the transport of oxygen from a gas bubble to inside a cell.
   (b) Write a brief note on determination of oxygen transfer rates by the sulfite oxidation method. [8+8]

8. Discuss in detail about the following solid-liquid separation processes.
   (a) Filtration

(b) Centrifugation. [16]

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Code No: R05320804 **Set No. 2**

III B.Tech II Semester Regular Examinations, Apr/May 2008
BIO CHEMICAL ENGINEERING
(Chemical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Sketch the diagram showing the kingdom of protists.
   (b) Describe the general features of bacteria and molds. [6+10]

2. Define the M-M parameters, and determine the V_{max} and K_m for the following reaction
   Urea + Urease → [Urea-Urease] → $2NH_3$ + CO_2 + Urease
   The rate of reaction is a function of urea concentration from the following table

[C] urea, (kmol/L)	0.20	0.02	0.01	0.005	0.002
-r, urea (kmol/L.s)	1.08	0.55	0.38	0.20	0.09

   [6+10]

3. What is Immobilization and describe the different types of Enzyme Immobilization? [16]

4. Describe the transient growth kinetics with a neat sketch, explain the phases of growth? [16]

5. Give a detailed account of carbohydrates with suitable examples. [16]

6. (a) Discuss in detail the salient features of an ideal plug flow reactor. Derive a design equation for an ideal plug flow reactor.
   (b) Compare and contrast CSTR and PFR used as a bioreactor. [10+6]

7. Discuss in detail the production of penicillin with a neat sketch and description. [16]

8. (a) Describe any two physical methods for cell rupture.
   (b) Discuss about chemical and biological methods for cell disintegration. [8+8]

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Code No: R05320804 **Set No. 3**

III B.Tech II Semester Regular Examinations, Apr/May 2008
BIO CHEMICAL ENGINEERING
(Chemical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Give the general characteristics of the following;
Cell wall, Plasma membrane, Endoplasmic reticulum.
(b) Explain budding, sexual fusion, fission, sporulation, with a neat diagram. [6+10]

2. The initial rate of reaction for the enzymatic cleavage of deoxyguanosine triphosphate was measured as a function of initial substrate concentration as follows:

Substrate concentration μ mol/L	Initial reaction rate μ mol/(L.min)
6.7	0.30
3.5	0.25
1.7	0.16

(a) Calculate the Michealis-Menten constants of the above reaction.
(b) When the inhibitor was added, the initial reaction rate was decreased as follows:

Substrate μ mol/L	Inhibitor μ mol/L	Initial reaction rate μ mol/L.min
6.7	146	0.11
3.5	146	0.08
1.7	146	0.06

Is this competitive inhibition or non competitive inhibition? Evaluate the kinetic parameters. [8+8]

3. (a) With a simplified diagram, explain the Calvin cycle
(b) Write short notes on macromolecule synthesis. [8+8]

4. Describe the various growth phases of batch cultivation and elucidate the different perspectives of cell population? [16]

5. Discuss in detail about carbohydrates with suitable examples. [16]

6. (a) Describe the various configurations of CSTRs used for enzyme-catalyzed reactions.
(b) Derive the general substrate balance equation for the single enzyme catalyzed reaction S→P taking place in a CSTR. [10+6]

7. (a) Discuss about the different methods of scale up of bireactors.

(b) Discuss in detail about power requirement of agitated vessels under non-aerated and aerated conditions. [8+8]

8. Describe the various methods available for cell rupture. [16]

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Code No: R05320804 **Set No. 4**

III B.Tech II Semester Regular Examinations, Apr/May 2008
BIO CHEMICAL ENGINEERING
(Chemical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Name the twenty amino acids commonly found in proteins and explain how proteins are formed by condensation of aminoacids. Give the reactions involved. [16]

2. (a) What are the differences and similarties between enzymes and synthetic catalysts? Explain
   (b) Give the classification of enzymes and the major classes of reactions that they catalyze. [8+8]

3. Describe the synthesis of glucose from pyruvate with the help of a figure showing the pathway. [16]

4. (a) Define dilution rate and yield coefficient based on biomass in a CSTR and establish that D=F/V_R
   (b) Explain the environmental factors that affect the growth kinetics? [8+8]

5. What are carbohydrates? Explain in detail with examples. [16]

6. Write in detail about CSTR cell reactors with recycle and wall growth. [16]

7. (a) Discuss about continuous sterilization of media with neat schematic diagrams.
   (b) Mention the advantages and drawbacks of continuous sterilization. [10+6]

8. Discuss in detail about the following solid-liquid separation processes.
   (a) Filtration
   (b) Centrifugation. [16]

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