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Total number of printed pages – 2

B. Tech  
PCBT 4402

Seventh Semester Back Examination – 2014

BIOREACTOR DESIGN AND ANALYSIS

BRANCH : BIOTECH

QUESTION CODE : L153

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. Answers the following questions briefly : 2 × 10
- (a) What is a bioreactor ? How homogenous reaction is related to bioreactor ?
  - (b) Write down the applications of air lift fermenter.
  - (c) Differentiate between ideal and non ideal reactors.
  - (d) Write assumptions in the Kunii-Levenspiel model (at least two).
  - (e) Write down the advantages of bubble column reactor.
  - (f) Define Ideal bioreactor. How it differs from Non-ideal bioreactor ?
  - (g) What is biosensor ? Give one suitable example.
  - (h) What is mixing time ? What is the relationship between mixing time and circulation time ?
  - (i) Define phauxostat.
  - (j) What is Hollow fiber reactor ?
2. What is FBR ? Give details on construction and mechanisms of Fluidized Bed Reactor. 10
3. (a) Describe the basic aspects of reaction theory. 6
- (b)  $\alpha$ -Amylase is used for production of high cellulose syrup.  $\Delta H^{\circ}_{rxn}$  for reaction = 5.73 kJ gmol<sup>-1</sup>,  $\Delta S^{\circ}_{rxn}$  for reaction = 0.0176 kJ gmol<sup>-1</sup>K<sup>-1</sup>, R = 8.3144 Jgmol<sup>-1</sup>K<sup>-1</sup>, Calculate the equilibrium constants at 50°C and 75°C. 4

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4. Define Ideal bioreactor. Derive the material balance equation for ideal CSTR and PFR. 10
5. Write any **two** of the following : 5×2
- (a) Fluidized bed Reactor
  - (b) Mixed Reactor
  - (c) Valves in bioreactor.
6. Describe the computer control, sensing technologies and its application in bioreactor. 10
7. What is RTD ? Write down the theories for RTD. How to calculate it for PFR and CSTR? 1+3+6
8. Answer any **two** of the following : 5×2
- (a) Reactor stability
  - (b) Different control process for bioreactor
  - (c) Continuous Stirred Tank Reactors (CSTR).

