

Registration No. :

--	--	--	--	--	--	--	--	--	--

Total number of printed pages – 2

B. Tech  
PCBT 4402

Seventh Semester (Special) Examination – 2013

BIOREACTOR DESIGN AND ANALYSIS

BRANCH : BIOTECH

QUESTION CODE : D 401

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. Answer the following questions :

2×10

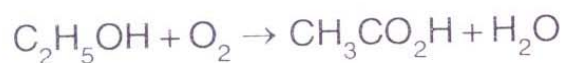
- What is a homogeneous reaction ?
- What do you mean by a CSTR?
- What is rheology ?
- Why is immobilization of enzymes necessary in reactors?
- Why is oxygen mass transfer required in bioreactors ?
- Write down three important parameters to be controlled in bioreactors.
- What is residence time distribution ?
- What is a three phase reactor ?
- What is a biosensor ?
- Expand and define the term  $Y_{x/s}$ .

2. (a) Describe the working of a batch reactor with proper diagrams.

5

(b) Aerobic production of acetic acid from ethanol is shown as follows :

5



The bacteria are added to medium containing  $50 \text{ gL}^{-1}$  ethanol. After some time, the ethanol concentration is  $5 \text{ gL}^{-1}$  and  $7.5 \text{ gL}^{-1}$  acetic acid is produced. Find out the observed and theoretical yields.

P.T.O.

3. (a) Why is a hollow fibre reactor important in animal cell culture ? Give diagrams to support your answer. 5
- (b) Write a short note about adiabatic reactor. 5
4. Explain the principle and working of a plug flow reactor with suitable diagrams. 10
5. (a) How is scale up of a bioreactor achieved by using constant P/V approach ? 5
- (b) Write four requirements of online sensors in monitoring of bioreactors. 5
6. (a) Show in a well-labelled diagram the transfer of an oxygen bubble from bulk gas phase to interior of a cell. 5
- (b) What is gas-liquid reactor ? Write down two applications of gas-liquid reactors. 5
7. (a) What is a bubble column reactor ? Explain its working with help of diagram. 5
- (b) What are the different types of valves used in bioreactor ? 5
8. Write short notes on any **two** of the following : 5×2
- (a) Multiphase reactors
- (b)  $k_L a$
- (c) Perfusion reactor for animal cell culture
- (d) Reactor stability

