Registration no: | | | | | | | | | | |

Total Number of Pages: 01 **B.TECH**
PCBT4402

7th Semester Regular / Back Examination 2015-16
BIOREACTOR DESIGN & ANALYSIS
BRANCH: BIOTECH

Full Marks -70
Time: 3- Hours

Q.CODE: T336

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions:** **(2 x 10)**

a) What is a bioreactor? Define non ideal reactors with suitable example
b) What are the methods used for measurement of $k_L a$.
c) What are the advantages of immobilizing enzymes in bioreactor? (Any two).
d) Define chemostat.
e) What are the advantages of bubble column reactor?
f) Define mixing time? What is the relationship between mixing time and circulation time?
g) What is gas liquid reactor? Give one suitable example.
h) Write assumptions in the Kunii-Levenspiel model (at least two)?
i) Write down different parameters for scale up process.
j) What is Mixed Reactor?

Q2 What is CSTR. Give details on construction and mechanisms of Continuous stirred tank Reactor? **(10)**

Q3 **a)** Describe the membrane reactor and its advantages. **(5)**
b) What is specific death constant? Differentiate between observed yield and apparent yield. **(5)**

Q4 Define Residence Time Distribution? What are the theories for RTD. How to calculate it for PFR and CSTR. **(10)**

Q5 Write **any two** of the following: **(5 x 2)**

a) Plug Flow reactor.
b) Multiphase reactor
c) Agitation system in bioreactor

Q6 Define Ideal bioreactor. Derive the material balance equation for ideal Fluidized bed reactor. **(10)**

Q7 Describe the computer control, sensing technologies and its application in bioreactor. **(10)**

Q8 Write short notes on **any two**: **(5 x 2)**

a) Biosensor
b) Perfusion reactors in animal cells
c) Reactor with immobilized microbial cells