Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech**
PBT6I101

6th Semester Regular Examination 2018-19
BIOREACTOR DESIGN AND ANALYSIS
BRANCH : BIOTECH
Max Marks : 100
Time : 3 Hours
Q.CODE : F984

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.
The figures in the right hand margin indicate marks.

Part- I

Q1 **Only Short Answer Type Questions (Answer All-10)** **(2 x 10)**

a) What is a sprager? Name two types spragers?
b) Define off-line and on-line sensor?
c) State the working principle of an air lift fermenter?
d) What do you understand by the term reactor stability?
e) What is rheology?
f) Define residence time distribution?
g) Draw and label the parts of a bubble column reactor?
h) Write the advantage of membrane reactor?
i) What do you understand by scale up and scale down?
j) List out the different type of impeller used in bioreactor?

Part- II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Diagrammatically represent tubular reactor?
b) Distinguish between adiabatic and programmed reactors?
c) Discuss in detail the use of perfusion reactor for animal and plant cell culture.
d) Analyse theprinciples of kinetics for chemical and bio-chemical Reactions.
e) Describe different types of ideal reactors and explain why they are called ideal reactors?
f) What are difficulties and some considerations we have to follow aeration, agitation and heat transfer in the scale up of the bioreactor.
g) Derive performance equation for a CSTR?
h) Write in brief about recycle reactor?
i) Write short notes on control of a bioreactor?
j) Explain the static method for the determination of mass transfer coefficient in aerated bioreactor?
k) Explain in detail the mechanical fittings in a bioreactor?
l) Discuss the method in detail used for finding kLa in a bioreactor?

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3	Draw CSTR? State the advantage of running fed batch process of fermentation over batch process?	**(16)**
Q4	How do you interpret the batch reactor data to obtain the kinetics of a reaction? Explain integral method of analysis using first-order irreversible reaction as an Example.	**(16)**
Q5	Explain in detail mass transfer of immobilised enzymes /cells in packed bed reactor?	**(16)**
Q6	Describe in detail how the study of a heterogeneous reaction is useful to a bioprocess engineer?Give some reactions in support of your ideas?	**(16)**