2053
B.E. (Biotechnology) Sixth Semester
BIO-613: Bioreactor Design and Operation

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt *five* questions in all, including Question No. I which is compulsory and selecting two questions from each Section.

x-x-x

1. Write briefly: *(1×10 = 10)*

    a) How does the pH probe work?
    b) What is downtime in a batch bioreaction?
    c) With decreasing peclet number, the performance of sterilizer will --------.
    d) What is riser and downcomer?
    e) What is the use of strain gauge in a biorecator?
    f) For high viscosity culture, Which reactor is best choice?
    g) What is the expression of dilution rate in immobilized enzyme reaction?
    h) What are recycle ratio and biomass concentration factor in a continuous stirred tank reactor?
    i) Define total effectiveness factor for an enzymatic reaction.
    j) What is gas hold up?

SECTION-A

2. a) What are the effect of product characteristics on bioreactor design and operation?
   b) Compare between bubble column and air lift reactor.

                                                                                    (5, 5)

3. a) What are the important features of a membrane bioreactor?
   b) How can we calculate light utilization in a photobioreactor?

                                                                                    (6, 4)

4. a) What will be the mass balance equation of limiting substrate when product formation is not directly coupled with energy metabolism?
   b) Oxygen consumption in a microbial culture is measured at a cell concentration of 28 g l^{-1}. A straight line is found when oxygen concentration is plotted with time spent inside the reactor. The slope of the curve is -5.6×10-3 m mol l^{-1} min^{-1}. What will be the rate constant for oxygen uptake? If the cell concentration is reduced to 12 g l^{-1}, what will be the value of rate constant?

                                                                                    (5, 5)

                                                                                    P.T.O.

SECTION-B

5. a) Explain various approaches for monitoring and control of pressure, flow rate and agitator shaft power.

b) Explain characteristics and operation of P, I, D control.

(5, 5)

6. a) Design continuous sterilization equipments through flow diagram.

b) Mathematically express the importance of axial dispersion coefficient on the extent of cell destruction in a sterilizer.

(5, 5)

7. a) Explain about fermenter dynamics and indicate conditions for stability.

b) How RTD helps to understand kinetics of a non ideal reactor?

(5, 5)

x-x-x