Exam.Code:0910
Sub. Code: 33377

2055

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 Unit.

x-x-x

1. Write briefly:

   a) What is gas holdup?

   b) How does aspect ratio play important role for increasing aeration in reactor?

   c) What is cell washout in a reactor?

   d) Give example of chemical anti foaming agent.

   e) What are various types of automatic control system?

   f) What are the materials used in membrane bioreactor?

   g) What are the types of DO probes available?

   h) Why fed batch culture is best choice for bakers yeast production?

   i) What is total downtime in a batch bioreactor?

   j) How can we express light utilization for monochromatic light in photobioreactor? (10x1)

UNIT - I

2. a) Derive mass balance equation of a fed batch culture for limiting substrate utilization where product formation is not directly coupled with energy metabolism.

   b) Derive mass balance equation for immobilized cells in a chomostat cascade. (5, 5)

3. a) What are the important features and applications of a membrane bioreactor?

   b) Differentiate between bubble column and air lift reactor. (5, 5)

4. a) What are traditional and non-traditional method of selection of organism for a bioreactor?

   b) Media design is a complex subject in bioreactor research. Justify the term with proper explanation. (5, 5)

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UNIT - II

5. a) What are the technologies available for measuring process variables in a bioreactor?
   b) Draw a diagram of a CSTR and include all the major controls. (7, 3)

6. a) Differentiate between the working principle of continuous and batch sterilization process.
   b) Damkohler number is an important dimensionless number to determine performance of a sterilizer. Justify the statement. (5, 5)

7. a) Why residence time distribution calculation is important to characterize a non-ideal reactor? What are the methodologies available for RTD determination?
   b) Gluconic acid production in a fermenter is following first-order reaction. The value of K_1 is given as 0.10 h^{-1}. Initially the product concentration was 4.1 g / l. What will be the concentration of product after 20 h and 40 h.
   c) Differentiate between true and observed yield of a reaction

(5, 2.5, 2.5)

x-x-x