Exam. Code: 0909
Sub. Code: 33369

2076

B.E. (Biotechnology) Fifth Semester

BIO-512: Bio-Process Engineering

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. Assume any missing data.

x-x-x

1. Answer the following:-

   a) Define critical biomass concentration.

   b) Explain the importance of scale-down.

   c) What are the major components of AMP model?

   d) Define apparent viscosity in context of fluid rheology.

   e) State various feeding methodologies for fed-batch culture.

   f) Define impeller flooding.

   g) Discuss the role of precursors in a fermentation medium.

   h) Obtain an expression for steady-state cell-mass concentration in a chemostat as a function of D.

   i) Describe a correlation for ks and μ.

   j) What is biorisk management? (10x1)

UNIT - I

2. a) Give a brief account on product formation in a batch culture. Support your answer with suitable plots and/or expressions.

   b) Discuss the following in context of chemostat culture

      i) washout

      ii) contamination from with-in. (4,6)

3. Enlist major factors involved in scale-up of any fermentation process. Suggest suitable scale-up approaches for an aerated and agitated bioreactor. Justify your recommendations. (10)

4. a) Discuss how fermentation medium may influence oxygen availability during fermentation.

   b) Discuss in details the Placket-Burman method as a technique for medium optimization. (4,6)

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UNIT - II

5. a) Discuss any two rheologies having a close match with penicillin broth rheology. Also, explain the effect of medium and culture rheology on aeration capacity of the fermenter.

   b) What are the various control measures of containing biological risks? Arrange these measures in the order of the most effective to the least effective manner. (5,5)

6. a) Deduce the Log-penetration equation for air filtration with discussion on constant 'k'. Also elaborate the various mechanisms of separation behind filter sterilization.

   b) With the help of the graph, explain the effect of activation energy on spore destruction and nutrient degradation with increasing sterilization temperatures. (5,5)

7. a) Define k_La. Enlist different techniques for the assessment of k_La. Give a detailed account on any one technique discussing its merits and demerits.

   b) Discuss various correlations for power requirements in terms of operating variables in an aerated/agitated bioreactor. (6,4)

x-x-x