**BIO CHEMICAL REACTION ENGINEERING (R09) 2011**

**SET 1**

1. Discuss about the conventional bio-reactors with all aspects.
2. Explain the following in briefly
   1. Kinetics for thermal death of cells?
   2. Serialization of air?
3. Draw the growth profile curve and derive the kinetics for batch culture.
4. Discuss the estimation of kinetic parameters in details.
5. Discuss in detail about mathematical model of bubble column bioreactor with recycle.
6. Discuss in detail about the rate of mass transfer in Liquid-liquid and liquid- gas reactions.
7. Draw a neat schematic diagram of different steps involved in transportation of oxygen from a gas bubble to inside a cell and explain.
8. Derive the equations for finding E by using pulse, step experiments.

**SET 2**

1. Explain the following
   1. Different classifications of bioreactors.
   2. Conventional bio reactors.
2. Discuss about the radiation and chemical sterilization process.
3. Discuss in detail about growth kinetics in continuous culture and also explain about chemo state growth.
4. Derive the design equation for continuous tank ferm enters in series without and with recycle of biomass.
5. Write detailed note on fluidizes bio reactor.
6. Discuss in detail about the rate of mass transfer in Liquid-liquid and liquid-solid reactions.
7. Derive the equation for KLA measurement by using any method of your choice.
8. Discuss the relationship between E and F curves.

**SET 3**

1. Explain the following
   1. Write difference and similarities between chemical and bioreactors in detail.
   2. Conventional bio reactors.
2. Discuss in detail about continuous sterilization with neat block diagrams.
3. Write the following in detail
   1. About the semi continuous feeding strategies.
   2. Write a note on fed batch growth.
4. Derive the design equations for CSTR with washout concept.
5. Write note on:
   1. Packed bed bioreactor
   2. Airlift reactors.
6. Discuss about the following
   1. Basic mass transfer concepts.
   2. factors affecting cellular oxygen demand.
7. Discuss about the following
   1. Mass transfer correlations.
   2. Scale up concept of bioreactor.
8. Discuss and derive the equations for large deviation from plug flow with graphs.

**Set 4**

1. Write the following
   1. Different classifications of bioreactors.
   2. Conventional bio reactors.
2. Discuss in details about batch sterilization with respect to temperature time profiles.
3. Discuss in detail about growth kinetics in continuous culture and also explain about chemo state growth.
4. Derive the design equation for PFR and discuss about batch growth of microorganisms.
5. Discuss in detail about mathematical model of bubble column bioreactor with recycle.
6. Write note on the following:
   1. Convective mass transfer
   2. Oxygen transfer in fermenters
   3. Define bio processing.
7. Draw a neat schematic diagram of different steps involved in transportation of oxygen from a gas bubble to inside a cell and explain.
8. Discuss and derive the equations for fitting the dispersion model for small extents of dispersion with graphs.