Paper Code: MTBT-102	**Roll No.**									

M. Tech
FIRST SEMESTER EXAMINATION, 2016-17
BIOPROCESS ENGINEERING & TECHNOLOGY

[Time: 3 hrs.] [Max. Marks: 70]

Note: – Attempt all questions. All questions carry equal marks

1. Attempt any four parts of the following:- **[3.5x4=14]**

(a) Discuss different characteristics of fermentation broth and their effect on downstream processing.
(b) Derive the expression for fed-batch system and also differentiate between variable volume fed batch culture and fixed volume fed batch culture system.
(c) Explain why flow properties of newtonian and non newtonian fluids are important in bioprocess industry
(d) Discuss the branched pathway in feedback regulation mechanism in brief.
(e) Explain how a lytic enzyme or a group of lytic enzymes can be used to disrupt cells in cell suspension.

2. Attempt any four parts of the following:- **[3.5x4=14]**

(a) Discuss the method for the overproduction of primary metabolites by decreasing the concentration of a repressing or inhibiting end product.
(b) Define the mass transfer? Give the different methods used in molecular diffusion theory.
(c) Explain the principle and methodology for isoelectric focus with the suitable diagram.
(d) Define centrifugal force of rotor. A fixed angle rotor with the minimum radius of 3 cm and maximum radius of 18 cm is operated at 18000 rpm. Calculate the RCF at the top and bottom of the centrifuge.
(e) Discuss the different controlling parameters applied during fermentation process.

3. Attempt any two parts of the following:- **[7x2=14]**

(a) Write short notes on any two of the following
  i. Continuous rotatory drum filter
  ii. Response surface methodology
  iii. Simplex design
(b) Discuss the factors affecting oxygen transfer in CSTR. Derive the expression for static and dynamic gassing out technique.
(c) How knowledge of rheological properties of products of interest, impurities and solvent plays a major role in downstream processing.

4. Attempt any two parts of the following:- **[7x2=14]**

(a) During the execution of medium optimization for antibiotic production, researcher performed plackett burman design for the screening of effective medium components. Effects of peptone, yeast extract, glucose, lactose and three dummy variables are 17.5, 15.0, 12.5, 2.0, 5.5, 1.25 and 0.5 respectively. On the basis of t value find out the order of their effectiveness.

(b) Discuss the industrial production of hepatitis and conjugate vaccine and their applications.

(c) Define the terms and express the relationship between of the following
   (i) K_La and Power consumption
   (ii) Operating variables and power consumption
   (iii) Power consumption of viscous flow and turbulent flow
   (iv) Respiratory quotient and oxygen absorbed

5. Attempt any two parts of the following:- **[7x2=14]**

(a) Define chromatography and its phases in short. Explain the basic principle of Ion exchange chromatography and HPLC and its application.

(b) What are the steps for material balance calculation? Corn steep liquor contains 2.5% invert sugars and 50% water; the rest can be considered solids. Beet molasses containing 50% sucrose, 1% invert sugars, 18% water and the remainder solids is mixed with corn-steep liquor in a mixing tank. Water is added to produce a diluted sugar mixture containing 2% (w/w) invert sugars, 125 kg corn-steep liquor and 45 kg molasses are fed into the tank.
   (i) How much water is required?
   (ii) What is the concentration of sucrose in the final mixture?

(c) Derive an expression for pressure drop across packed bed bioreactor.