

# Bioprocess Modeling & Simulation

Sem-7 - BioTech - Bioprocess mod & sim + (model board.

(1/2)

(22)

Q. P. Code: 16524

Duration: 3hrs

Total marks: 80

## Instructions:

1. Question No.1 is compulsory
2. Attempt any three questions from remaining five questions
3. All question carry equal marks
4. Assume suitable data if necessary and indicate it clearly

Q.No. 1. Explain any four of the following

(20M)

- a) Application of modeling and simulation in bioprocesses
- b) Enzyme growth kinetics models
- c) Batch distillation
- d) Differentiate between linear and nonlinear model
- e) Mathematical model for batch reactor

Q.No.2.a) Solve the following equation using Gauss- Siedal iteration method

(10M)

$$10X_1 - 2X_2 - X_3 - X_4 = 3$$

$$-2X_1 + 10X_2 - X_3 - X_4 = 15$$

$$-X_1 - X_2 + 10X_3 - 2X_4 = 27$$

$$-X_1 - X_2 - 2X_3 + 10X_4 = -9$$

b) Given the following  $F(x) = X^4 - X - 10$ ,  $X_0 = 2$ , find the roots corrected to 3 decimal places using Newton-Raphson method.

(10M)

Q.No.3. a) Explain biochemical kinetic model for anaerobic digestion.

(10M)

b) Give detail account on modeling of activated sludge process.

(10M)

Q.No.4 .a) Give mathematical model for isothermal constant holdup CSTR in series. (10M)

b) Develop the mathematical model of thermal death kinetics for batch sterilization. (10M)

24

13

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- Q.No.5. a) Evaluate  $\int_1^0 dx/1+X$ , correct three decimal places. Solve this using Trapezoidal rule (10M)  
with  $h= 0.5$ . (10M)
- b) Find the solution of following integral using Simpson's 1/3<sup>rd</sup> rule,

$$\int_2^3 \frac{dx}{\sqrt{X^2 + 1}}$$

- Q.No.6 .a) Develop a mathematical model for ethanol fermentation process. (10M)
- b) How to develop kinetic model for antibiotic production? Explain. (10M)

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