B.E-VII Sem-Biotech Modeling & simulation
Biotech - Bio process-3
10/5/2016
(17)
BE/VII/CBGS/BT/BMS.
Extra

QP Code : 31317

(3 Hours) [Total Marks - 80

Note: i) Q.No 1 is compulsory.
ii) Answer any three of the remaining five questions.
iii) Assume suitable data where ever necessary.

Q. 1 a) Certain experimental values of x and y are given below: **10**

X	0	2	5	7
Y	-1	5	12	20

If y = a0+a1x, find approximate values of a0 and a1 using least square method.
b) Briefly discuss about Raoult's law and its applications. **10**

Q.2 a) Write the component continuity equation for a CSTR in which a "simultaneous reaction" (first- order, isothermal) takes place A $\xrightarrow{k1}$ B $\longrightarrow$ C **10**
b) Write component continuity equation for the same above system Inwhichreversible reaction takes place instead of simultaneous reaction. **10**

Q.3 Describe the simulation of Batch reactor using Runge-kutta Method. **20**

Q. 4 a) Given the following f (x) = x4 – x – 10, x0 = 2, Find the roots corrected to 3 decimal places using Newton-Raphson method. **10**
b) Evaluate I = $\int_0^1 \frac{dx}{1+x}$, correct to three decimal places. Solve this using trapezoidal rule with h=0.5. **10**

Q.5 Develop a mathematical model for a simple gravity flow tank into which an incompressible liquid is pumped at a variable flow rate of F0 (m3/s). This inflow rate can vary with time because of changes in operations upstream.The height of the liquid in the vertical cylindrical tank is h (m). The flow rate out of the tank is F (m3/s). Discuss the Newton-Raphson algorithm for solving the modeled equations. **20**

Q.6 a) Derive the equation for the time required to achieve desired conversion in Batch reactor **10**
b) An ice cube is dropped into a hot, perfectly mixed, insulated cup of coffee. List all assumption and define all terms. Develop the equations describing the dynamics of the system **10**