10/05/2016

Extra

B.E-VII Sem - Biotech Modeling & simulation
Biotech - Bioprocess Modeling & simulation
(17)   BE/VII/CBGS/BT/BMS.
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 $y = a_0 + a_1 x$, find approximate values of a_0 and a_1 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 $A \xrightarrow{k_1} B \longrightarrow C$ 10
b) Write component continuity equation for the same above system
in which reversible 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 $f(x) = x^4 - x - 10$, $x_0 = 2$, 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   20
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.

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   10
dynamics of the system

FW-Con. 10606-16.