CODE NO: NR420803 NR

2006 JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

IV B.TECH II SEMESTER SUPPLEMENTARY EXAMINATIONS
COMPUTER APPLICATIONS IN CHEMICAL ENGINEERING
(CHEMICAL ENGINEERING)

APR/MAY 2006

TIME - 3 HOUR
MARK – 80

Answer any FIVE Questions
All Questions carry equal marks

1 1. Solve by using Runge-Kutta 4th order method:y' = x2+y2 with y(0) = 1, h = 0.1 in the interval [0,1].

[16]

2. Solve by Cramer's rule, the equations: 3x1 + x2 - x3 = 2, x1 + 2x2 + x3 = 3, -x1 + x2 + 4x3 = 9. [16]

3. Write a computational procedure to solve the following equation by matrix inversion method 16 x + 3y + 3z = 1 x + 4y + 3z = 0 x + 3y + 4z = 2. [16]

4. Write a computer program, which uses the Newton-Raphson method for the two equation in two unknowns. [16]

5. For the reaction CO2 (g) + 4H2(g) ! 2H2O(g) + CH4(g) the standard heat of reaction can be expressed as ∆ H0 T =∆ H' + ∆ T + (∆ /2)T2 + (∆ /3)T3 ; ∆ H'=- 148345 j; ∆ =-62.54; ∆ =46.3510-3 ; ∆ = -7.21 × 10-6 . Find the relevant temperature at which standard heat of reaction is equal to -183950j using iterative method.
[16]

6. Thermal conductivity of the metal strip was measured at various time intervals during the heating and the values are given in the following table: Time,t(min) 1 2 3 4 5 6 Temp.,T(C) 70 83 100 124 152 190
If the relationship between the temperature, T and time,t is of the form T=bet/4+aestimate the coefficients (a and b) using least square regression technique and esti- mate the temperature at t=8min. [16]

7. (a) Illustrate the importance of optimization techniques in chemical engineering giving at least four examples.

(b) Given the function f(x) = 80/x + 20x + 20, find the stationary points and test them for maxima or minima. [8+8]

8. Find the minimum of y = 10x2- 3x + 5 using Dichotomous search subject to restriction g(x) = x2 5 ∆ 10. Consider 6 calculations only.