Bachelor of Science (B.Sc. I.T.) Semester—IV (C.B.S.) Examination

NUMERICAL METHODS

Paper—VI

Time : Three Hours] [Maximum Marks : 50

N.B. :— (1) All questions are compulsory and carry equal marks.

(2) Assume the data wherever necessary.

EITHER

1. (a) Derive the Newton-Raphson iterative formula $x_{nH} = x_n - \frac{f(x_n)}{f'(x_n)}$ for solving f(x) = 0. 5

(b) Solve the following equation by using Bisection method.

$f(x) = x^3 - 2x - 5 = 0$ 5

OR

(c) Using false position method, solve the equation.

$f(x) = 4x^3 - 2x - 6 = 0$ 5

(d) Use the secant method to estimate the root of the equation $f(x) = x^2 - 4x - 10 = 0$, with the initial estimates of $x_1 = 4$ and $x_2 = 2$. 5

EITHER

2. (a) Solve the following system of equations by using Gauss elimination with partial pivoting :

$x_1 + x_2 - 2x_3 = 3$

$4x_1 - 2x_2 + x_3 = 5$

$3x_1 - x_2 + 3x_3 = 8$ 5

(b) Solve the following system of equation by using Gauss-Jordon method :

$2x_1 - 3x_2 + 4x_3 = 8$

$x_1 + x_2 + 4x_3 = 15$

$3x_1 + 4x_2 - x_3 = 8$ 5

OR

(c) Solve the following system of equations by using Gauss elimination method :

$x_1 + x_2 + x_3 = 3$

$2x_1 + 3x_2 + x_3 = 6$

$x_1 - x_2 - x_3 = -3$ 5

(d) What is Matrix Inversion method ? Explain with example. 5

EITHER

3. (a) Given the table of values :

i	0	1	2	3
x_i	1	2	3	4
$f(x_i)$	0.5	0.3333	0.25	0.20

Estimate the value of (2.5) using cubic spine functions. 5

(b) Fit a straight line to the following data :

x	1	2	3	4	5
y	3	4	5	6	8

5

OR

(c) What is multiple linear regression ? Explain. 5

(d) Use Lagrange's interpolation formula to find the value of y, when x = 2, for the data given below :

x	0	1	3	4
y	–12	0	6	12

5

EITHER

4. (a) Estimate y (0.4) using R–K fourth order method when :

$\frac{dy}{dx} = x^2 + y^2$ with y (0) = 0. Assume h = 0.2. 5

(b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Trapezoidal Rule taking h = 0.25. 5

OR

(c) Explain and derive the formula for Simpson's 1/3 rd Rule of Numerical Integration. 5

(d) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using Simpson's 3/8 Rule. Take h = 1. 5

5. (a) Find $\sqrt{5}$ correct-upto four decimal places by using Newton-Raphson method. 2½

(b) What is meant by partial pivoting ? Explain. 2½

(c) What do you mean by linear regression ? Explain. 2½

(d) Explain, the Runge-Kutta second order method. 2½