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

NUMERICAL METHODS

Paper—VI

Time—Three Hours] [Maximum Marks—50

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

(2) Assume the data wherever necessary.

EITHER

1. (a) Derive the false position formula for finding a root of equation. 5

(b) Compute a root of $x^2 - 5x + 6 = 0$ with $x_0 = 5$, using Newton-Raphson method. 5

OR

(c) Explain the Convergence of Secant method. 5

(d) Find a root of the equation $x^3 - x - 1 = 0$ using Bisection method. 5

EITHER

2. (a) What are the possibilities of a solution of a system of linear equations ? Explain each by giving an example. 5

(b) Solve the following system using basic Gauss elimination method

$$3x_1 + 6x_2 + x_3 = 16$$

$$2x_1 + 4x_2 + 3x_3 = 13$$

$$x_1 + 3x_2 + 2x_3 = 9$$ 5

OR

(c) Solve the equations using Gauss-Jordan method :

$$2x_1 + x_2 + x_3 = 7$$

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

$$x_1 - x_2 + x_3 = 0$$ 5

(d) Solve the following equations using Gauss elimination with partial pivoting :

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

$$2x_1 + 4x_2 + 9x_3 = 8$$

$$4x_1 + 3x_2 + 2x_3 = 2$$ 5

(b) Explain about ill conditioned systems with an example. 2½

(c) Derive Linear interpolation formula. 2½

(d) Using Composite trapezoidal rule evaluate

$$\int_{-1}^{1} e^x \, dx, \text{ for } n = 2$$ 2½

EITHER

3. (a) Given the set of values :

x	300	304	305	307
$\log_{10}^{x}$	2.4771	2.4829	2.4843	2.4871

Find $\log_{10}^{301}$, by using Lagrange's interpolation formula. 5

(b) Estimate the function value f at x = 7 using cubic splines for given data points :

i	0	1	2
x_i	4	9	16
f_i	2	3	4

5

OR

(c) Fit a straight line to the following set of data :

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

5

(d) Given the data table, fit a Power-function model of the form $y = ax^b$:

x	1	2	3	4	5
y	0.5	2	4.5	8	12.5

5

EITHER

4. (a) Given the initial value problem,

$$\frac{dy}{dx} = y - x \text{ with } y(0) = 2.$$

Find y(0.1) and y(0.2), by using Runge-Kutta second order method. 5

(b) Use the Simpson's 1/3 Rule with n = 4 to estimate,

$$\int_0^1 \frac{dx}{1+x^2}$$

correct to four decimal places. 5

OR

(c) Given the equation $y^1(x) = \frac{2y}{x}$ with y(1) = 2. Estimate y(2) using the Milne-Simpson predictor corrector method. Assume h = 0.25. 5

(d) Use Simpson's 3/8 rule to evaluate :

$$\int_0^{\pi/2} \sqrt{\sin x}\, dx \,.$$ 5

5. Attempt **ALL** the following :

(a) Given the limitations of Newton-Raphson method. 2½