

**Bachelor of Science (B.Sc.I.T.) Semester—IV Examination****NUMERICAL METHODS****Paper—VI**

Time : Three Hours]

[Maximum Marks : 50

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

(2) Assume suitable data wherever necessary.

(3) Draw neat and labelled diagram wherever necessary.

**EITHER**

1. (a) Find a root of equation  $x^2 - x - 2 = 0$  using Bisection Method. 5
- (b) Find a root of equation  $f(x) = x^2 - 3x - 2 = 0$  in the vicinity of  $x = 0$  using Newton-Raphson method. 5

**OR**

- (c) Derive the false position formula for evaluating a root of a non-linear equation. 5
- (d) Use secant method to estimate the root of the equation  $x^2 - 4x - 10 = 0$  with the initial estimates of  $x_1 = 4$  and  $x_2 = 2$ . 5

**EITHER**

2. (a) What is pivoting ? Distinguish between complete pivoting and partial pivoting. 5
- (b) Solve the following system of 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

**OR**

- (c) What are the possibilities of a solution of a system of linear equations ? Explain each by giving an example. 5
- (d) Solve the following  $3 \times 3$  system of equations using 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

**EITHER**

3. (a) Derive the Lagrange's interpolation formula for the set of  $(n + 1)$  points. 5
- (b) Fit a straight line to the following set of data :  

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

 5

**OR**

- (c) Fit the curve  $y = ae^{bx}$  to the following data :  

$x$	:	1	2	3	4
$y$	:	1.65	2.70	4.50	7.35

 5
- (d) Explain Spline interpolation with example. 5

**EITHER**

4. (a) What is Numerical Integration ? Derive the formula for Trapezoidal rule. 5
- (b) Use Simpson's 1/3 Rule with  $n = 4$  to estimate  $\int_0^1 \frac{dx}{1+x^2}$ . 5

**OR**

- (c) Use Trapezoidal Rule to compute

$$I = \int_0^1 \frac{1}{1+x} dx$$

correct upto three decimal places.

Assume  $h = 0.2$ . 5

- (d) Given the equation :

$$y'(x) = \frac{2y}{x} \text{ with } y(1) = 2$$

Estimate  $y(2)$  using Milne-Simpson predictor-corrector method.

Assume  $h = 0.25$ . 5

5. Attempt **ALL** :

- (a) Discuss the limitations of Newton-Raphson Method. 2½

- (b) Explain :

(i) System has a unique solution

(ii) System has no solution. 2½

- (c) Derive linear interpolation formula. 2½

- (d) Evaluate  $\int_0^1 \cos x dx$  by using Trapezoidal Rule.

Assume  $h = 0.25$  2½