

Bachelor of Science (B.Sc.) (I.T.) Semester—IV 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) Write notes on :
 - (i) Algebraic equation
 - (ii) Polynomial equation. 5
- (b) Find the root of the equation $x^2 - 4x - 10 = 0$ using bisection method. 5

OR

- (c) Derive the false position formula for evaluating a root of a non-linear equation. 5
- (d) Use the 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 are the possibilities of a solution of a system of linear equations ? Explain each by giving an example. 5
- (b) Solve the system :

$$2x_1 + 4x_2 - 6x_3 = -8$$

$$x_1 + 3x_2 + x_3 = 10$$

$$2x_1 - 4x_2 - 2x_3 = -12$$
 using Gauss-Jordan method. 5

OR

- (c) Solve the following system of equations using partial pivoting technique :

$$2x_1 + 2x_2 + x_3 = 6$$

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

$$x_1 + x_2 + x_3 = 0.$$
 5
- (d) Solve the following equations

$$2x_1 + x_2 = 25$$

$$2.001x_1 + x_2 = 25.01$$
 and thereby discuss the effect of ill-conditioning. 5

EITHER

3. (a) Find the Lagrange's interpolation polynomial to fit the following data :

i	0	1	2	3
x_i	0	1	2	3
$e^{x_i} - 1$	0	1.7183	6.3891	19.0855

Use the polynomial to estimate the value of $e^{1.5}$.

5

- (b) Derive normal equations for evaluating the parameters a and b to fit data to straight line $y = a + bx$.

5

OR

- (c) Given the data points :

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

estimate the function value f at $x = 7$ using cubic splines.

5

- (d) Given the table of data :

x	1	2	3	4
y	0	1	2	3
z	12	18	24	30

obtain a regression plane to fit the data.

5

EITHER

4. (a) Discuss Trapezoidal rule and its error analysis in numerical integration.

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- (b) Use Simpson's 3/8 rule to evaluate $\int_1^2 (x^3 + 1) dx$ using $h = 0.25$.

5

OR

- (c) Use the classical RK method to estimate $y(0.4)$ when $y'(x) = x^2 + y^2$ with $y(0) = 0$. Assume $h = 0.2$.

5

- (d) Discuss accuracy of one-step method.

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5. (a) Discuss stopping criteria for an iterative process.

2½

- (b) Explain Matrix Inversion method.

2½

- (c) State whether following polynomial is splines or not :

$$f(x) = \begin{cases} x^2 + 1 & 0 \leq x \leq 1 \\ 2x^2 & 1 \leq x \leq 2 \\ 5x - 2 & 2 \leq x \leq 3 \end{cases}$$

2½

- (d) Evaluate following integral using Simpson's 1/3 rule $\int_{-1}^1 e^x dx$.

2½