Roll No. ....

DD–2862

B. C. A. (Part II) EXAMINATION, 2021

Paper First

NUMERICAL ANALYSIS

Time : Three Hours

Maximum Marks : 50

Note : All questions are compulsory. Attempt any *two* parts from each Unit. All questions carry equal marks. Simple/Scientific calculator is allowed.

Unit—I

1. (a) Compute the real root $x^3 - 5x + 3 = 0$ in the interval [1, 2] by Regular Falsi method.

   (b) Computer the positive root of the equation $x^4 - x - 10 = 0$ by Newton-Raphson method.

   (c) Explain solution of cubic and Biquadratic equation.

P. T. O.

Unit—II

2. (a) Using Gauss-Jordan method, find the inverse of the matrix :

$$\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$$

(b) Find the eigen values and eigen vectors of the matrix.

$$A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$$

(c) Using the partition method, find the inverse of :

$$A = \begin{bmatrix} 13 & 14 & 6 & 4 \\ 8 & -1 & 13 & 9 \\ 6 & 7 & 3 & 2 \\ 9 & 5 & 16 & 11 \end{bmatrix}$$

Unit—III

3. (a) Derive Newton's forward interpolation formula.

(b) Use Lagrange's interpolation formula to find the value of y when $x = 10$, if the following values of x and y are given :

x :	5	6	9	11
y :	12	13	14	16

(c) Derive Newton's divided difference Interpolation formula.

Unit—IV

4. (a) Explain numerical differentiation and integration.

(b) Evaluate $\int_0^1 \frac{dx}{1+x}$ taking 7 ordinates by applying Simpson's $\frac{3}{8}$th rule. Deduce the value of $\log e^2$

(c) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using :

(i) Trapezoidal rule taking $h = \frac{1}{4}$

(ii) Weddle's rule taking $h = \frac{1}{6}$

Unit—V

5. (a) Explain numerical solution of first order ordinary differential equations.

(b) Solve the following by Euler's modified method :

$$\frac{dy}{dx} = \log (x+y), y(0) = 2$$

at $x = 1.2$ and 1.4 with $h = 0.2$

(c) Apply Runge-Kutta fourth order method to find an approximate value of y when $x = 0.2$ given that

$$\frac{dy}{dx} = x + y$$

and $y = 1$ when $x = 0$.