

Roll No.

Paper Code - BCA 5004

BCA 3<sup>rd</sup> Year (Semester-V) EXAMINATION, 2023-24

NUMERICAL METHODS

Paper-IV

Time : Two Hours]

[Maximum Marks : 75

K-024

**Note-** This paper consists of three Section A, B and C. Carefully read the instructions of each Section in solving the question paper. Candidates have to write their answers in the given answer-copy only. No separate answer-copy (B Copy) will be provided.

#### Section-A

##### (Short Answer Type Questions)

**Note-** All questions are compulsory. Answer the following questions as short answer type questions. Each question carries 5 marks.

1. (A) Prove that  $(1 + \Delta)(1 - \nabla) = 1$ .
- (B) Explain the term divided difference.

- (C) Construct the divided difference table for the following data :

x: 0 1 2 4 5 6

f(x): 1 14 15 5 6 19

- (D) Write the Lagrange's Formula. Where it is used ?
- (E) Prove that  $E = e^{hD}$ .
- (F) Write the Quadrature Formula.
- (G) Explain the algorithm of Gauss Elimination Method.
- (H) Explain in brief about Runge-Kutta Method.
- (I) Find the third divided difference  $f(3, 4, 5, 6)$  where  $f(x) = x^3 - x$ .

#### Section-B

##### (Long Answer Type Questions)

**Note-** This section contains four questions from which one question is to be answered as long question. Each question carries 15 marks.

2. Write the algorithm of Gauss Seidal Method. Solve the following question by Gauss-Seidal Method -

$$27X + 6Y + Z = 85$$

$$6X + 15Y + 2Z = 72$$

$$X + Y + 54Z = 110$$

(Or)

3. Find  $\frac{dy}{dx}$  at  $x = 1.2$  given that.

x:	1	2	3	4	5
y:	0	1	5	6	8

(Or)

4. Using Simpson's  $1/3$  rule find  $\int_{0.2}^{1.4} \sin x \, dx$ .

(Or)

5. Explain the bisection method. Find the root of the equation  $x^3 - x - 11 = 0$ .

### Section-C

#### (Long Answer Type Questions)

**Note-** This section contains four questions from which one question is to be answered as long question. Each question carries 15 marks.

6. Use Sterling formula to find  $Y_{28}$  given  $Y_{20} = 49225$ ,  $Y_{25} = 48316$ ,  $Y_{30} = 47236$ ,  $Y_{35} = 45926$ ,  $Y_{40} = 44306$ .

(Or)

7. Write the algorithm of Newton-Raphson Method. Using Newton-Raphson method, find the real root of the equation  $3x = \cos x + 1$  correct to four decimal places.

(Or)

8. (a) What do you mean by Interpolation and Derive the Newton's Forward Interpolation formula?

(b) Use Newton (Gregory) Backward formula to find the population for the year 1948 given :

Year	1901	1911	1921	1931	1941	1951
Population (in thousand)	12	15	20	27	39	52

(Or)

9. (a) Apply Gauss's forward formula to find the value of  $u_9$ , if  $u_0=14$ ,  $u_4=24$ ,  $u_8=32$ ,  $u_{12}=35$ ,  $u_{16}=40$ .

(b) Solve  $\frac{dy}{dx} = 1 + xy$  with  $x_0 = 2$ ,  $y_0 = 0$  using Picard's method of successive approximations.

....