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(21223)  
B.C.A.-V Sem.

(Printed Pages 4)  
Roll No. ....

**18024**

**B.C.A. Examination, Dec.-2023**

**Numerical Methods**

**(BCA-504)**

*Time : Three Hours / [Maximum Marks : 75*

**Note :** Attempt questions from **all** sections as per instructions. Calculator is allowed.

**Section-A**

**Note :** Attempt **all** the **five** questions. Each question carries **3** marks.  $3 \times 5 = 15$

1. Using Newton-Raphson method, find an iterative formula to compute  $\sqrt[3]{N}$ , where  $N$  is a positive number.
2. Prove that  $E \nabla = \nabla E = \Delta$ , where  $E$  is shift operator,  $\nabla$  is backward difference operator &  $\Delta$  is forward difference operator.

**P.T.O.**

3. Find the first derivative of the function given below at the point  $x = 1.2$

x	1	2	3	4	5
f(x)	0	1	5	6	8

4. Solve the following equations by using Gauss-elimination method :

$$x - y + z = 1$$

$$-3x + 2y - 3z = -6$$

$$2x - 5y + 4z = 5$$

5. Perform two iterations of Picard's method to find an approximate solution of the initial value problem

$$y' = x + y^2; y(0) = 1.$$

**Section-B**

**Note :** Attempt any **two** questions out of the following three questions. Each question carries 7.5 marks.  $2 \times 7.5 = 15$

6. Using method of False position, find a positive root of the equation

$$x^3 - 4x + 1 = 0.$$

**18024/2**

7. Using Newton's forward interpolation formula, find the cubic polynomial which takes on the following values

x	0	1	2	3	4
y	-1	0	13	50	123

8. Using Simpson's  $\left(\frac{1}{3}\right)^{th}$  rule, find the value of  $\int_{-1}^5 f(x) dx$  given that :

x	1	2	3	4	5
f(x)	10	50	70	80	100

### Section-C

**Note :** Attempt any **three** questions out of the following five questions. Each question carries 15 marks.  $3 \times 15 = 45$

9. Find a positive root of the equation  $2x = 3 + \cos x$  by Bisection method.
10. Using Lagrange's interpolation formula, find the value of  $y$  corresponding to  $x=2$  from the following table :

x	0	1	3	4
y	5	6	50	105

18024/3

11. Evaluate  $\int_0^1 \frac{dx}{1+x^2}$  by using Simpson's  $\left(\frac{3}{8}\right)^{th}$  rule.

12. Solve by Gauss-Seidel method

$$3x + y + z = 1$$

$$x + 3y - z = 11$$

$$x - 2y + 4z = 21.$$

13. Apply Runge-Kutta method fourth order to find an approximate value of  $y$  when  $x=0.2$ , given that

$$\frac{dy}{dx} = x + y^2 \quad \& \quad y = 1 \text{ when } x = 0$$

(take  $h = 0.1$ ) **6.5181**

18024/4

P.T.O.