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(21223) Roll No. .....

B.C.A.-V Sem.

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. 3×5=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 , ∇ is backward difference operator & Δ 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. 2×7.5=15

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

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

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 $\left(\frac{1}{3}\right)^{rd}$ 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. 3×15=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

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

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

(take $h= 0.1$)