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BCS–054

BACHELOR OF COMPUTER APPLICATIONS [BCA (REVISED)]

Term-End Examination

June, 2025

BCS-054 : COMPUTER ORIENTED NUMERICAL TECHNIQUES

Time : 3 Hours *Maximum Marks : 100*

Note : *(i) Any calculator is allowed during examination.*

(ii) Question No. ***1*** *is compulsory. Attempt any* ***three*** *questions from question no.* ***2*** *to question no.* ***5****.*

1. (a) Solve the following system of equations using Gauss Elimination method. Does

this method produce a solution for this system ? 6

$$6x + 2y + 4z = 6$$

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

$$2x + y + z = 0.$$

(b) Find the smallest positive root for equation $x^3 + 3x^2 - 6 = 0$ using bi-section method, show three iterations. 6

(c) Find the Newton's forward difference interpolating polynomial which fits into the data given below : 8

x	$f(x)$
1	5
2	14
3	27
4	44
5	65
6	90

Use this polynomial to find the value of $f(1.25)$.

(d) Use Gauss-Seidel iterative method to solve the following system of linear equations : 6

$$2x + y = 7$$

$$x + 4y = 14$$

Use initial value $x_0 = 1,\ y_0 = 1$. Perform three iterations.

(e) Derive the relationship between E and the following operators : 4

(i) ∇

(ii) δ

(f) Briefly discuss the terms accuracy, precision and significant digits with suitable example for each. 6

(g) Explain the following operators with the help of its formula : 4

(i) Shift operator (E)

(ii) Averaging operator (μ)

2. (a) Give methods for interpolation with equal intervals and interpolation with unequal intervals. Find the Lagrange's interpolating polynomial for the following data : 10

x	$f(x)$
1/4	–1
1/3	2
1	7

Hence evaluate $f(1/2)$ using the interpolating polynomial.

(b) Use Euler's method to find the solution of the IVP given below : 10

$$y' = -2ty^2,\ y(0) = 1$$

take the interval [0, 1] with step size $h = 0.2$.

3. (a) Find positive root of $x^3 + 4x^2 - 10 = 0$ by using Regula-Falsi method. Perform four iterations. 10

(b) Prepare the divided difference table for the following data : 10

x	$f(x)$
–3	–28
0	2
1	4
3	32
4	70

Find $f(2)$ using Newton's divided difference formula.

4. (a) Calculate the value of $\int_4^{5.2} \log x \, dx$, using : 10

(i) Trapezoidal rule

(ii) Simpson's 1/3 rule

assume step size (h) = 0.2.

(b) Use Runge-Kutta method of order 4 to solve the IVP $y' = -2ty^2$ with $y(0) = 1$ and $h = 0.2$ on the interval [0, 1]. $\left(\text{note } y' \Rightarrow \frac{dy}{dx}\right)$. 10

5. Write short notes on the following : 4×5=20

(i) Improved Euler's method

(ii) Bessel's formula and its application

(iii) Unstable algorithms and Ill-conditional problems

(iv) Gauss-Jacobi iterative method of solving linear algebraic equations.

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