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BCS-054

BACHELOR OF COMPUTER APPLICATIONS (BCA) (REVISED)

Term-End Examination

June, 2023

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*** *more from the next four questions.*

1. (a) Use Gauss elimination method to solve the system of linear equations given below : 6

$$x_1 + x_2 + x_3 = 3$$

$$4x_1 + 3x_2 + 4x_3 = 8$$

$$9x_1 + 3x_2 + 4x_3 = 7$$

(b) Use Gauss Jacobi method to solve the system of linear equations given below (results should be correct upto two decimal places only) : 6

$$-4x_1 + x_2 + 10x_3 = 21$$

$$5x_1 - x_2 + x_3 = 14$$

$$2x_1 + 8x_2 - x_3 = -7 .$$

(c) Use Bisection method to find positive root of the equation $x^3 + 4x^2 - 10 = 0$, correct upto two places of decimal. 6

(d) Perform the following : 6

(i) Express operator E in terms of operator δ.

(ii) Express operator μ in terms of operator δ.

(e) Determine the Newton's forward difference interpolating polynomial that satisfies the data tabulated ahead : 6

x	$f(x)$
1	1
2	4
3	9
4	16
5	25

Also, find the value of $f(x)$ at $x = 1.7$.

(f) Determine y' and y'' at $x = 2.25$, using Newton's Forward Difference (FD) formula for the data given below : 5

x	$y = \sqrt{x}$
1.5	1.2247
2.0	1.4142
2.5	1.5811
3.0	1.7320
3.5	1.8708

(g) Calculate the value of the integral $\int_4^{5.2} \log x \, dx$, using Trapezoidal rule (assume $h = 0.2$). 5

2. (a) Use Euler method to find the solution of $y' = f(t, y) = t + y$, given $y(0) = 1$, take $h = 0.2$ and find solution on [0, 0.8]. 8

(b) Find Maclaurin's series of $f(x) = e^x$ around $x = 0$. 4

(c) Determine approximate root of the equation : 8

$$\cos x - xe^x = 0$$

using Secant method with two initial approximations as $x_0 = 0$ and $x_1 = 1$. Perform two iterations.

3. (a) Write Newton-Raphson iterative scheme to find inverse of an integer number N. Hence find inverse of 17 correct upto 4 places of decimal starting with 0.05. 8

(b) Write expressions for Δ, ∇, δ and μ operators in terms of operator E. 4

(c) Find Lagrange's interpolating polynomial for the data given below : 8

x	$f(x)$
$\frac{1}{4}$	-1
$\frac{1}{3}$	2
1	7

4. (a) Use Divided difference table to find the value of $f(a,b,c)$, for $f(x) = x^3$. 4

(b) Use Stirling's formula for differentiation on the data given below, to find the value of x for which $f(x)$ attains its maximum value : 10

x	$y = f(x)$
1	7
2	15
3	21
4	19
5	3

(c) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Simpon's rule, subdivide the interval (0, 1) into 6 equal parts. 6

5. (a) Solve the Initial Value Problem (IVP) $y' = -ty^2, y(2) = 1$. Also, find y (2.1) and y (2.2) with $h = 0.1$, using modified Euler's method. 10

(b) Use classical R-K method of order 4 to solve the IVP $y' = 2y + 3e^t, y(0) = 0$; and find y (0.1), $y(0.2)$ and $y(0.3)$. 10