D6BMC2303 (PAGES 2) **Reg. No.....**

Name: .....

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2026

(Regular/Improvement/Supplementary)

COMPUTER SCIENCE AND MATHEMATICS (DOUBLE MAIN)

GDMA6B10T: NUMERICAL ANALYSIS

Time: 2 Hours **Maximum Marks: 60**

SECTION A: Answer the following questions. Each carries *two* marks.

(Ceiling 20 marks)

1. Determine the five-digit (a) chopping and (b) rounding values of the irrational number $\sqrt{2}$.
2. Write Three-point endpoint formula to approximate the derivative of f (x) at x_0.
3. Define a convex set in $\mathbb{R}^2$.
4. Distinguish forward and backward difference formula to approximate the derivative of a function.
5. Write the error bounds for Euler method.
6. Find h when approximating $\int_0^3 x\sin x\, dx$ using Midpoint rule.
7. What do you mean by root finding problems?
8. Let f (x) = $x^2 - 6$. Use Secant method to find p_2.
9. Find $L_0(x)$ and $L_1(x)$ for the nodes x_0 = 2, x_1= 3, and x_2= 4
10. Use the numbers (called nodes) x_0 = 2 and x_1= 2.75 to find the first Lagrange interpolating polynomial for f (x) = $\frac{1}{x}$.
11. What is meant by mesh points?
12. Write Modified Euler method to approximate solution for an initial value problem $y' = f(t, y),\ a \le t \le b, y(a) = \alpha$.

(PTO)

SECTION B: Answer the following questions. Each carries *five* marks.

(Ceiling 30 marks)

13. Use the Bisection method to find solutions accurate to within 10^{-3} for the function $f(x) = e^x - x^2 + 3x - 2 = 0$ for $0 \leq x \leq 1$.
14. Values for $f(x) = xe^x$ are given below.

    x : 1.8 1.9 2.0 2.1

    f (x) : 10.889365 12.703199 14.778112 17.148957

    Approximate $f''(2.0)$ using Second derivative midpoint formula and find absolute error.
15. Approximate $\int_0^3 x\sin x\, dx$ using Midpoint rule.
16. Approximate a root of $x^3 - 2x^2 - 5 = 0$ on [1, 4] accurate to within 10^{-3} using Secant method.
17. Construct the second degree Lagrange interpolating polynomials for the function $f(x) = e^{2x}\cos 3x$ using the nodes $x_0 = 0$, $x_1 = 0.3$, and $x_2 = 0.6$
18. Use the forward-difference formulas and backward-difference formulas to determine each missing entry in the following table.
19. Use Taylor's method of order two to approximate the solutions for the following initial-value problem:

    $y = te^{3t} - 2y$, $0 \leq t \leq 1$, $y(0) = 0$, with $h = 0.5$

SECTION C: Answer any *one* question. The question carries *ten* marks.

20. Construct the second degree Lagrange interpolating polynomials for the function $f(x) = e^{2x}\cos 3x$ using the nodes $x_0 = 0$, $x_1 = 0.3$, and $x_2 = 0.6$. Then find f (0.25).
21. Use Euler's method to approximate the solution to $y' = y - t^2 + 1, 0 \leq t \leq 1.5$, $y(0) = 0.5$ with $h = 0.5$.

(1 x 10 = 10 Marks)