D5BMT2103 (PAGES 2) **Reg.No.....**

Name: .....

FIFTH SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2023

(Regular/Improvement/Supplementary)

MATHEMATICS

GMAT5B07T: NUMERICAL ANALYSIS

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

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

(Ceiling 20 Marks)

1. Write the Three-point End point formula.
2. Determine the Lagrange interpolating polynomial through the points (2,4) and (5,1).
3. Use Newton's method to solve $x = 2\cos x$ for P_3.
4. Define a convex set in R^2.
5. Write the Runge-Kutta method order 4.
6. Show that $f(x) = x^3 + 3x^2 - 5$ has a root in [1,2].
7. Express $\Delta^2 f_0$ and $\Delta^3 f_0$ in terms of values of the function.
8. Write Newton Backward – Difference formula.
9. Define degree of accuracy of a quadrature formula and write degree of precision of Trapezoidal rule.
10. Write Simpson's Three - Eights rule.
11. Write the Second Derivative Midpoint Formula.
12. Find $\int_0^2 x^2\, dx$ by Simpson's rule.

(PTO)

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

(Ceiling 30 Marks)

13. Use Secant method to find solutions accurate to within 10^{-4} for the equation
. $f(x) = x^3 + 3x^2 - 1$ in [0 ,1] .

14. Use the Trapezoidal rule to approximate $\int_0^2 \frac{2}{x^2+4} dx$, n=6.

15. Use Lagrange interpolating polynomial of degree 3 to approximate f(8.4) if

    f (8.1) = 16.94410, f(8.3) = 17.56492, f(8.6) = 18.50514, f(8.7)=18.82091.

16. Use Euler's method to approximate the solution for $y' = 1 + 2ty$ with $y(0) = 0$

    h =0.02 for $x = 0.1$.

17. Show that the initial value problem $\frac{dy}{dt} = y - t^2 + 1, 0 \le t \le 2, y(0) = 0.5$ is well posed

    on D =$\{(t, y): 0 \le t \le 2, -\infty < y < \infty\}$.

18. Apply Newton's forward difference formula to find the value of $f(0.25)\ if\ f(0.1) = -0.62049958,\ f(0.2) = -0.28398668,\ f(0.3) = 0.00660095, f(0.4) = 0.24842440$

19. Approximate the integral $\int_0^{10} \frac{1}{x} dx$ using open and closed Newton-Cotes formula.

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

20. Apply Taylor's method of order four to approximate the solution of $y' = 1 + (t - y)^2$,

    $2 \le t \le 3, y(2) = 1$ with h=0.5.

21. Let $f(x) = x^3 - x^2 - 5$. Find solutions accurate to within 10^{-4} using.

    a) Newton method.

    b) Method of False position in [2, 3].

(1 x 10 = 10 Marks)