D5BMT2203 (2 Pages) Name.....
Reg.No.....

FIFTH SEMESTER B. Sc. DEGREE EXAMINATION, NOVEMBER 2024

(Regular/Improvement/Supplementary)

MATHEMATICS

GMAT5B07T: NUMERICAL ANALYSIS

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

Section A: Answer the following questions. Each carries 2 marks. (Ceiling 20 Marks)

1. Calculate the relative and absolute errors when approximating $p = \pi$ by $p^* = \frac{22}{7}$.
2. Find all fixed points of the function $f(x) = \frac{x^3 - 1}{x^2 + 1}$.
3. Define numerical quadrature.
4. Calculate $\int_0^2 x^4 dx$ using Simpson's rule.
5. Is the set $\{(t, y)/\ 0 < t < 2,\ -1 < y < 2\}$ convex? Justify your answer.
6. Define Lipschitz constant for a function.
7. Write the Three point Endpoint formula.
8. Define the linear Lagrange polynomial that passes through the points $(1, 2)$ and $(3, 5)$.
9. Write Newton forward difference formula.
10. Write the formula for modified Euler method.
11. State one advantage of Secant method over Newton method.
12. Write the formula for Taylor method of order 4.

(PTO)

Section B: Answer the following questions. Each carries 5 marks.

(Ceiling 30 Marks)

13. **Use Newton backward difference formula to find $f(6)$ for the following data,**

x	$f(x)$
1	24
3	120
5	336
7	720

14. **Find P_4 of the function $x = 2\sin(x)$ using Newton method.**

15. **Using Lagrange's interpolation formuala find $f(8.4)$ for the following data,**

x	$f(x)$
8.1	16.94
8.3	17.56
8.6	18.50
8.7	18.82

16. **Approximate the following $\int_1^{10} \frac{1}{x^2} dx$ using open Newton-Cotes formula.**

17. **Approximate $\int_0^1 \frac{2}{x-4} dx$ by means of Trapezoidal rule and Simpson's Three-Eight rule.**

18. **Use Euler's method to approximate the value of y for $t = 1$ for initial value problem $y' = t + y,\ y(0) = 0, h = 0.2$.**

19. **Use the appropriate formula to approximate $f'(0.4)$ and $f''(0.4)$ for the given data,**

x	$f(x)$
0.2	0.979
0.4	0.917
0.6	0.808
0.8	0.638
1.0	0.384

Section C: Answer any one question. Each carries 10 marks.

20. **Use Runge - Kutta method of order 4 with $h = 0.2$ to approximate $y' = 1 + y^2,\ 0 \le t \le 0.6,\ y(0) = 0$**

21. **Find the positive root of $x^3 - 9x + 1 = 0$ on [2,4] by Bisection method.**

$(1 \times 10 = 10$Marks$)$