D 50667 **(Pages : 3)** **Name.....**

Reg. No.....

FIFTH SEMESTER (CBCSS—UG) DEGREE EXAMINATION
NOVEMBER 2023

Mathematics

MTS 5B 07—NUMERICAL ANALYSIS

(2020 Admission onwards)

Time : Two Hours Maximum : 60 Marks

Section A

Answer any number of questions.
Each question carries 2 *marks.*
Ceiling is 20.

1. State the formula for Newton's method.
2. Find all fixed points of the function $f(x) = \frac{x^3 - 1}{x^2 + 1.}$
3. What is an algebraic polynomial ? Give an example.
4. State Fixed Point Theorem.
5. State one advantage of Secant method over Newton's method.
6. Write Newton's backward difference formula.
7. Write the Simpson's rule for $\int_0^2 x^2\, dx$.
8. Write the formula for the method of false position
9. Does the set $\{(t, y), -1 < t < 2, 0 < y < 1\}$ is a convex set ? Justify your answer.
10. What is Lipschitz constant ?
11. What is a well posed problem ?
12. What is the 'Degree of Accuracy' of a quadrature formula ?

Turn over

Section B

Answer any number of questions.
Each question carries 5 *marks.*
Ceiling is 30.

13. Find the positive root of $x = \cos x$ using Newton's method.

14. Use Newton's forward difference formula to find a polynomial of degree four which takes the values :

x	$f(x)$
2	0
4	0
6	1
8	0
10	0

15. Using Lagrange's formula of interpolation find $f(9.5)$ given :

x	$f(x)$
7	3
8	1
9	1
10	9

16. Approximate the integral $\int_0^6 \frac{1}{1+x^2}$ using Simpson's rule.

17. Consider the following table of data :

x	$f(x)$
50	3.6840
51	3.7084
52	3.7325
53	3.7563
54	3.7798
55	3.8030
56	3.8259

Use backward difference formula to approximate the value of $f'(56)$.

18. Use Euler's method to approximate the solution for $y' = t + y, y(0) = 1, h = 0.2$.

19. Apply Taylor's method of order two to approximate the solution for the initial value problem $y' = y - t^2 + 1, 0 \le t \le 2, y(0) = 0.5$.

Section C

Answer any **one** *question.*
The question carries 10 *marks.*

20. Show that the Mid point method and Modified Euler method give the same approximations to the initial value problem $y' = -y + t + 1, 0 \le t \le 1, y(0) = 1$ for any choice of h. Why is this true ?

21. Find the positive root of $x^3 - 9x + 1 = 0$ by Bisection method within 10^{-4} accuracy.

(1 × 10 = 10 marks)