22/10/25

TM253509M

Reg. No :.....

Name :.....

MASTER'S DEGREE (C.S.S) EXAMINATION, NOVEMBER 2025

2024 ADMISSIONS REGULAR

SEMESTER III - CORE COURSE

MT3C13TM20 - Numerical Analysis with Python

Time : 3 Hours **Maximum Weight : 30**

Part A

I. Answer any Eight questions. Each question carries 1 weight **(8x1=8)**

1. Explain solve() function with an example.
2. Write the Python code to solve the polynomial inequality $-x^2 + 4 < 0$.
3. Write a program to find the critical points of the function $f(x) = x^5 - 10x^3 - 19$.
4. Write a program to find the derivative of the function $f(x) = x^2 e^{2x} + \sin 3x$.
5. Discuss the concept of interpolation.
6. What is the Newton Raphson formula to find the root with multiplicity m of $f(x) = 0$.
7. Construct a function that returns the coefficients of Newton's interpolating polynomial $P_n(x)$.
8. Explain briefly the Trapezoidal rule.
9. Briefly describe Gauss Elimination method.
10. What is known as LU decomposition? Mention any two LU decompositions.

Part B

II. Answer any Six questions. Each question carries 2 weight **(6x2=12)**

11. Write Python code to get LHS from RHS and vice versa of the given equation: $x^3 + 3x^2y + 3xy^2 + y^3 = (x + y)^3$.
12. Write a program that define a symbolic expression $x^2 + 2xy + y^2$ and simplify it when x is 1-y. What will be the output of this program?
13. Write a program to evaluate $\int_0^{\pi/2} \cos x \, dx$.
14. Write a program to calculate the partial derivative of a multivariable function cos xy +3xy with respect to x and y.
15. Explain Bisection method.
16. Construct the divided difference table of Newton's method for the given data points. What will be the degree of the interpolation polynomial?

x	-3	2	-1	3	1
y	0	5	-4	12	0

17. Derive Simpson's 1/3 rule from Newton-Cotes formulas.
18. Describe the two phases in Doolittle's Decomposition Method.

Part C

III. Answer any Two questions. Each question carries 5 weight **(2x5=10)**

19. (a) Write a program to input a number n and a particular value of x and print the series $1 + \frac{x}{2} + \frac{x^2}{3} + \ldots + \frac{x^n}{n}$ for that number n and its sum for the value x.

(b) Use solve () function to find t from $s = u\,t + 12at^2$, given s, u and a.

20. (a)Write a program to input any two single variable functions of x and print the enclosed area between the two.

    (b) Write the output of the above program for two functions x and x^2 from x=0 to x=1.

21. Using Newton's method, find the polynomial that fits the following data points.

x	-2	1	4	-1	3	-4
y	-1	2	59	4	24	-53

22. Evaluate the bounds on $\int_0^{\pi} \sin(x)\,dx$ with the composite trapezoidal rule using (1) 8 panels; and (2) 16 panels.