TM243299S

Reg. No :.....

Name :.....

MASTER'S DEGREE (C.S.S) EXAMINATION, NOVEMBER 2024

2023 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 with an example: expand () function.
2. Write the output:
   >>>p = x * (x + x)
   >>>p
3. Write a program to find the critical points of the function $f(x) = x^5 - 10x^3 - 19$.
4. Write a program to evaluate $\int e^x dx$
5. Explain the concept of curve fitting.
6. Construct a function that evaluates the Newton's interpolating polynomial $P_n(x)$ at any value x.
7. Construct a function that returns the coefficients of Newton's interpolating polynomial $P_n(x)$.
8. Explain briefly the Trapezoidal rule.
9. What is a pivot equation?
10. Explain Newton-Cotes Formulas.

Part B

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

11. Write a program that asks the user for two expressions and graph them both in two different colors. The program should also find their points of intersection.
12. Write the code in Python to get solution of the quadratic equation $x^2 + x + 1 = 0$ as a dictionary and write the output.
13. Write a program to evaluate $\int_0^{\pi/2} \cos x \, dx$.
14. Illustrate with an example the program to find the second order derivative of a function.
15. Explain Lagrange's method for polynomial interpolation.
16. Derive the coefficients of Newton's interpolating polynomial.
17. Estimate $\int_0^{2.5} f(x)dx$ from the following data:

x	0	0.5	1.0	1.5	2.0	2.5
f(x)	1.5000	2.0000	2.0000	1.6364	1.2500	0.9565

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. Write a program to input an inequality and solve it. (Program should create a function isolve () that will take

any inequality, solve it and then return the solution).

20. (a) Write a program to find the length of an arc between any two points for any arbitrary function f(x).
    (b) Write the output of the above program for f(x) = $\sqrt{1 - x^2}$ 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.