22002314

QP CODE: 22002314

Reg No : .....

Name : .....

MSc DEGREE (CSS) EXAMINATION , NOVEMBER 2022

Second Semester

CORE - ME010203 - NUMERICAL ANALYSIS WITH PYTHON

M Sc MATHEMATICS,M Sc MATHEMATICS (SF)

2019 Admission Onwards

CE3F9FFF

Time: 3 Hours

Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. Write a short note on *print()* with example.
2. Write a program to solve the equation using the argument dict = True. What will be the output of this program.
3. Find the errors (if any) in the following Python code:
   from sympy import symbol, limit, pprint
   x = symbol('x')
   l = limit(sin(x)/x, x, 0).doit()
   pprint l
4. Write a program to find $\frac{\partial}{\partial y}[x^3 + y^3]$.
5. Write a program to find $\frac{\partial^2 f}{\partial x^2}$, if $f(x, y) = x^3 + 8xy + 9y^2x + y^3$.
6. Define polynomial interpolation.
7. Define zeros of a function.
8. Explain the method of bisection
9. What you mean by a system of algebraic equations.
10. Briefly explain the Composite trapezoidal rule.

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11. (a) Write a short note on subs() with proper illustration.
    (b) Write a short note on Python dictionary with the help of an example.

12. Write a program to plot the function $f(x) = 2x^2 + 3,\ x \in [-1, 1]$

13. (a) How can we find the definite and indefinite integrals of functions using Python? Illustrate with examples.
    (b) Write a program to evaluate the integral $\int_0^{\pi} 2x \sin x \, dx$.

14. Write a program to find the area enclosed by the functions $f(x) = x^2$ and $g(x) = x^3$ between $x = 0$ and $x = 2$.

15. Explain Lagrange's polynomial and cardinal function.

16. Use Newton- Raphson method to obtain successive approximations of $\sqrt{5}$ as the ratio of two integers.

17. Explain and write the algorithm involved in the elimination phase in Gauss Elimination method.

18. What you mean by quadrature? Derive Newton Cotes formula.

(6×2=12 weightage)

Part C (Essay Type Questions)

*Answer any **two** questions.*

*Weight **5** each.*

19. (a.) Write a Python program to print the series expansion of $\log(\frac{1+x}{1-x}) = 2x + \frac{2}{3}x^3 + \frac{2}{5}x^5 + \frac{2}{7}x^7 + \ldots$ where $x \in (-1, 1)$ upto n terms, and to calculate the sum at the point $x = 0.5$, where n is taken as user input.
    (b.) Write a Python program to input the expressions $x^4 + 3x^3 + 4x + 2$ *and* $3x^3 + 2x^2 + 3$. Calculate its product and display them

20. (a) Write a derivative calculator program.
    (b) Write a program to check the continuity of a function at a point.

21. (a) Write down the newtonPoly algorithm.
    (b) The data points

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

lie on a polynomial. Determine the degree of this polynomial by constructing a divided difference table.

22. Solve the system of equations $4x - 3y + z = 7; 3x + 4y - z = 16; x + y + z = 6$ using LU decomposition method.

(2×5=10 weightage)