QP CODE: 23004831

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Reg No : .....

Name : .....

MSc DEGREE (CSS) EXAMINATION , JULY 2023

Second Semester

CORE - ME010203 - NUMERICAL ANALYSIS WITH PYTHON

M Sc MATHEMATICS,M Sc MATHEMATICS (SF)

2019 Admission Onwards

6DC47DAD

Time: 3 Hours

Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. How can you expand an expression using Python? Give example.
2. Write program to plot the line $y = 4x + 5$ with x ranging from -6 to 6.
3. Write a program to evaluate the limit $\lim_{x\to\infty} \frac{1}{x+1}$.
4. Find the errors in the following Python code for finding the partial derivative of $f(x, y) = \sin x + \cos xy$ with respect to x.

```
from Sympy import Symbol, pprint
x=Symbol('x')
y=Symbol('y')
f=sin x+cos xy
D=Derivative(f,x).doit()
pprint D
```

5. Write a program to find the definite integral $\int_1^4 x^2 + x \, dx$.
6. Write short note on curve fitting.
7. Write the algorithm to find recurrence relation to calculate $P_n(x)$ in Newton's method.
8. Define roots of an equation.
9. Define lower triangular matrix with example.
10. Briefly explain the Newton Cotes formula.

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11. (a) Describe the use of init_printing() in python.
    (b)Describe the use of 'Pretty Printing' with an illustration.

12. Write a Python program to display the first 10 Fibonacci numbers

13. (a) Write a program to find the critical points of the function $f(x) = 3x^3 + 20x - 9$.
    (b) Write a program to find $\frac{\partial^2 f}{\partial x^2} + \frac{\partial^2 f}{\partial y^2}$, if $f(x, y) = x \sin y + x^2 y$.

14. Write a program to find the length of the arc between any two points for any given function $f(x)$.

15. What you mean by cardinal functions. Give example.

16. Use Newton- Raphson method to obtain successive approximations of $\sqrt{3}$ as the ratio of two integers.

17. Explain elimination phase using in Gauss elimination method for the system of simultaneous equations
    $x_1 - 3x_2 + 4x_3 = 2; 2x_1 + 3x_2 - x_3 = 4; 3x_1 + 4x_2 + x_3 = 12.$

18. Decompose $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$ into L and U.

(6×2=12 weightage)

Part C (Essay Type Questions)

*Answer any **two** questions.*

*Weight **5** each.*

19. (a.) Write a program to display the first 5 terms of the series expansion of
    $\log(1 + x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \ldots$. Using this series display the value of $log2$.
    (b)Write a Python program to input the expressions $x^5 + 5x^4 + 3x + 1$ *and* $x^3 + 2x^2 + 3$. Calculate its product and display them

20. How to determine the global maximum and minimum of a function using Python? Explain using an example.

21. Find the root of $x^3 - 10x^2 + 5 = 0$ that lies in the interval (0, 1) to four – digit accuracy by the method of bisection. Write its algorithm.

22. Evaluate the bounds on $\int_0^{\pi} cosx\ dx$ with composite trapezoidal rule using (a) 8 panels and (b) 16 panels.

(2×5=10 weightage)