



QP CODE: 20000644

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MSc DEGREE (CSS) EXAMINATION, NOVEMBER 2020 Second Semester

CORE - ME010203 - NUMERICAL SOLUTION WITH PYTHON

M Sc MATHEMATICS, M Sc MATHEMATICS (SF)

2019 Admission Onwards

15F24FB2

Time: 3 Hours

Weightage: 30

Part A (Short Answer Questions)

Answer any eight questions.

Weight 1 each.

- 1. Write a python program to factorize the expression x^2-y^2 also print the factors as the output
- 2. How can we plot graphs in Python?
- 3. Write a program to evaluate the limit $\lim_{\theta \to 0} \frac{\cos 2\theta}{2\theta}$ from the negative side.
- 4. Write a program to find the critical points of the function $f(x) = x^5 10x^3 19$.
- 5. Write a program to evaluate the definite integral $\int_0^5 x^2 + 2x + 4 \ dx$.
- 6. Explain the concept of curve fitting.
- 7. What is the recurrence relation to calculate $P_n(x)$ in Newton's method?
- 8. What are the roots (if exist) of the function tanx x?
- 9. Which procedure is known as backward substitution for 3x3 matrix?
- 10. Briefly explain the Trapezoidal rule.

(8×1=8 weightage)

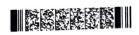
Part B (Short Essay/Problems)

Answer any six questions.

Weight 2 each.

- 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?
- 12. Describe about solving a system of linear equations in Python with example.
 - (a) Write a program to find the derivative of the function $f(x) = x^2 e^{2x} + \sin 3x$.
- 13. (b) Write a program to find the partial derivatives of the function $f(x,y) = \cos xy + 3xy$ with respect to x and y.
- 14. Write a program to calculate the length of the curve $f(x) = \sqrt{1-x^2}$ between x=0 and x=1.
- 15. Find the root of the equation x3 x 11 = 0 using bisection method.
- 16. Explain Newton-Raphson method.





17. Find the LU decomposition of the matrix $\begin{bmatrix} 2 & 3 & 1 \\ 1 & 2 & 3 \\ 3 & 2 & 1 \end{bmatrix}$ 18. What you mean by see

18. What you mean by general problem of numerical integration? 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 expnasion of

$$an^{-1}(x)=x-rac{x^3}{3}+rac{x^5}{5}-rac{x^7}{7}+\dots$$
 where $-1\leq x\leq 1$ 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 two expressions, calculate its product and display them
- 20. (a) Consider a car moving along a road. It accelerates uniformly such that the distance travelled, S, is given by the function $S(t)=5t^2+2t+8$. Write a program to find the instantaneous speed of the car at time t_1 , using the Limit () function.
 - (b) Write a program to calculate the derivative of an input function with respect to an input variable.
- 21. (a)Derive Lagrange's Interpolation formula.
 - (b) Using Lagrange's interpolating formula, find the form of the function y(x) from the following table:

x	0	1	3
у	-12	0	12

- 22. (a) Write the algorithm for the elimination phase in Gauss elimination method.
 - (b) Use Gauss elimination to solve the equation AX = B where

$$A = \begin{bmatrix} 6 & -4 & 1 \\ -4 & 6 & -4 \\ 1 & -4 & 6 \end{bmatrix} \text{ and } B = \begin{bmatrix} -22 \\ -18 \\ 7 \end{bmatrix}$$

(2×5=10 weightage)

