

MSc DEGREE END SEMESTER EXAMINATION- MARCH 2025**SEMESTER 4 : MATHEMATICS****COURSE : 21P4MATTEL19 : NUMERICAL ANALYSIS***(For Regular - 2023 Admission and Supplementary 2022/2021 Admissions)*

Duration : Three Hours

Max. Weights: 30

PART A**Answer any 8 questions****Weight: 1**

1. Find the extremum of $f(x) = 3x^2 - 2x - 2 = 0$. (A, CO 2)
2. Write Python code to find $\lim_{x \rightarrow 0} \frac{\sin x}{x}$. (A, CO 2)
3. Define third divided difference. (U, CO 3)
4. Substitute n=2 in NewtonCotes formula to obtain $\int_{x_0}^{x_2} f(x)dx$. (U, CO 4)
5. What is the formula for composite trapezoidal rule? (R, CO 4)
6. Write the recurrence relation of the interpolating polynomial $P_n(x)$ in Newtons method. (U, CO 3)
7. What are the functions used for factorizing and expanding an expression? Give examples. (U, CO 1)
8. Define local minimum and global maximum. (U, CO 2)
9. Define error obtained in Lagrange interpolation. (R, CO 3)
10. Identify the result of the following codes:
 $\gg p = (x + 3) * (x + 4)$
 $\gg p$ (A, CO 1)

(1 x 8 = 8)**PART B****Answer any 6 questions****Weights: 2**

11. Explain the method of finding limit of function in Python. (U, CO 2)
12. Write the Python codes for finding A_{ij} and b_i for Gauss elimination method. (U, CO 4)
13. Write a program to print the series $x + \frac{x^2}{2} + \frac{x^3}{3} + \dots + \frac{x^n}{n}$ for a given value of n and x. (A, CO 1)
14. Derive the composite form of Simpson 1/3 rule. (R, CO 4)
15. Find the Lagrange interpolating polynomial approximating $y = \ln x$ defined by the following table. Hence find the value of $\ln 2.7$.

| | | | |
|---|---------|---------|---------|
| x | 2 | 2.5 | 3 |
| y | 0.69315 | 0.91629 | 1.09861 |

(A, CO 3)

16. Write Python codes to find the area between the curves $y = x$ and $y^2 = x$. (A, CO 2)
17. If $y_1 = 4, y_3 = 12, y_4 = 19, y_x = 7$. Find x. (A, CO 3)
18. Write a program to factorise and expand (i) $x^2 + 2x + 3$ (ii) $x^2 + 11x + 10$. (A, CO 1)

(2 x 6 = 12)

PART C
Answer any 2 questions

Weights: 5

19. Solve the system of equation using Gauss elimination method
 $3x + y + 2z = 3$
 $2x - 3y - z = -3$
 $x + 2y + z = 4$ (A, CO 4)
 20. Explain the method of solving quadratic equation, system of linear equation and solving one variable in terms of the other. (U, CO 1)
 21. Explain Newtons interpolation method. (U, CO 3)
 22. Explain in detail the method of finding derivative of a function. (U, CO 2)
- (5 x 2 = 10)**

OBE: Questions to Course Outcome Mapping

| CO | Course Outcome Description | CL | Questions | Total Wt. |
|------|--|----|---------------------|-----------|
| CO 1 | Apply python program on mathematical equation. | U | 7, 10, 13, 18, 20 | 11 |
| CO 2 | Apply python program on derivative of functions, continuity, length of curve and area between curves | U | 1, 2, 8, 11, 16, 22 | 12 |
| CO 3 | Solve problems using Numerical methods. | U | 3, 6, 9, 15, 17, 21 | 12 |
| CO 4 | Solve problems using Numerical Integration methods. | U | 4, 5, 12, 14, 19 | 11 |

Cognitive Level (CL): Cr - CREATE; E - EVALUATE; An - ANALYZE; A - APPLY; U - UNDERSTAND; R - REMEMBER;