

M. Sc. DEGREE END SEMESTER EXAMINATION - MARCH 2024**SEMESTER 4 - MATHEMATICS****COURSE : 21P4MATTEL19 - NUMERICAL ANALYSIS***(For Regular - 2022 Admission and Supplementary - 2021 Admission)*

Duration : Three Hours

Max. Weights: 30

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

1. How to change the direction of limit using Python code while finding $\lim_{x \rightarrow \infty} \frac{1}{x}$. (A, CO 2)
 2. Define Lagrange inverse interpolation formula. (R, CO 3)
 3. Give an example of an equation which has one root. (U, CO 3)
 4. What is the formula for composite trapezoidal rule? (R, CO 4)
 5. Define third divided difference. (U, CO 3)
 6. Write Python to find $\lim_{x \rightarrow \infty} \frac{1}{x}$. (A, CO 2)
 7. How do we use .name on a label? (U, CO 1)
 8. How do we integrate a function using Python. (R, CO 2)
 9. Define Simpson 1/3 rule. (R, CO 4)
 10. Create a label x that refers to 2 and compute 2x+1 using python code. (A, CO 1)
- (1 x 8 = 8)**

PART B**Answer any 6 questions****Weights: 2**

11. Explain Newton Cotes formula. (U, CO 4)
12. Explain derivative calculator program. (A, CO 2)
13. 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)

14. Write a program to factorise and expand (i) $x^2 - y^2$
(ii) $x^3 - 4x^2 - 7x + 10$. (A, CO 1)
15. Find $\sin(\pi/6)$ given the following data :

x	$\pi/4$	$\pi/2$	0
y=sin x	0.70711	1	0

(A, CO 3)

16. 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)
17. Write a program to find the length of the curve $f(x) = 2x^2 + 3x + 1$ from $A(-5, 36)$ to $B(10, 231)$ and explain the same. (A, CO 2)

18. Use the result of LU decomposition $A = LU$ to solve $AX = b$ where
 $b^T = [1 \quad -1 \quad 2]$
 $L = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 1 & 5/3 & 1 \end{bmatrix} \quad U = \begin{bmatrix} 1 & 2 & 4 \\ 0 & 3 & 21 \\ 0 & 0 & 0 \end{bmatrix}$ (A, CO 4)
(2 x 6 = 12)

PART C

Answer any 2 questions

Weights: 5

19. Describe how to find the derivative of a function using Python codes. (U, CO 2)
20. How do we solve [i] polynomial inequalities [ii] rational inequalities [iii] univariate inequality. Explain in detail. (U, CO 1)
21. Use Gauss elimination method to solve $AX = b$ where
 $b^T = [22 \quad -18 \quad 7]$
 $A = \begin{bmatrix} 6 & -4 & 1 \\ -4 & 6 & -4 \\ 1 & -4 & 6 \end{bmatrix}$ (A, CO 4)
22. Certain values of x and $\log x$ are $(300, 2.4771)(305, 2.4843)(304, 2.4829)(307, 2.4871)$. Find $\log_{10} 301$ using Newtons method. (A, CO 3)
(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, 14, 16, 20	11
CO 2	Apply python program on derivative of functions, continuity, length of curve and area between curves	U	1, 6, 8, 12, 17, 19	12
CO 3	Solve problems using Numerical methods.	U	2, 3, 5, 13, 15, 22	12
CO 4	Solve problems using Numerical Integration methods.	U	4, 9, 11, 18, 21	11

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