



**PG (CBCS)**  
**M.Sc. Semester-I Examination, 2022**  
**MATHEMATICS**  
**PAPER: MTM 197 (PRACTICAL)**  
**(COMPUTATIONAL METHODS: USING MATLAB)**

**Full Marks: 25****Time: 2 Hours**

The figures in the right-hand margin indicate full marks.  
Candidates are required to give their answers in their own words as far as practicable.

**Answer one question from each group**

**Group-A**

**1 × 12**

- 1) Write a function program in MATLAB to find all Armstrong numbers between two specified numbers.
- 2) Write a script program in MATLAB to solve the following ODE and find the value of  $f(1)$  using Runge-Kutta method  $\frac{dy}{dx} = y - x^2 + 1$ ,  $y(0)=0.5$ .
- 3) Write a MATLAB function program to find a real root of the equation  $x^2 - \sin 2x - 1 = 0$  by Newton-Raphson's method.
- 4) Write a script in MATLAB to find the mean, median, variance and standard deviation for a set of discrete data.
- 5) Write a script in MATLAB to find an invertible matrix  $P$  and a diagonal  $D$  such that  $PDP^{-1} = A$ , then compare  $A^5$  and  $PA^5P^{-1}$ .
- 6) Write a user defined function in MATLAB to generate Fibonacci sequence. Use this function; write a script to find the Fibonacci numbers between two specified numbers.
- 7) Write a script in MATLAB to represent the graphs in the same window of the functions  $\sin x$ ,  $\sin 2x$  and  $\sin 3x$  in the range  $(0, 2\pi)$  with mentions different line specification, title, axes and axes limits.
- 8) Write a user defined function in MATLAB to determine the roots of a quadratic equation. Use this function; write a script find the roots of the equation  $x^2 + 5x + 6 = 0$ .
- 9) Write a user define function to find the value of  $\int_a^b f(x)dx$  by Simpson 1/3's rule. Use this function; write a script program to find the value of the following integration  $\int_0^1 x^2 + x dx$ .
- 10) Write a script program in MATLAB to solve the following ODE and find the values of  $f(0.1)$  and  $f(0.2)$  using Euler method  $\frac{dy}{dx} = x^2 + y^2$ ,  $y(0)=1$ .

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- 11) Write a user defined function in MATLAB to calculate the sum of a list of numbers. Using it, find the sum of all natural numbers between two specified numbers.
  - 12) Write a user defined function in MATLAB to calculate the roots of a general quadratic equation. Using it, find the roots of the equation  $x^2 + 5x + 6 = 0$ .
  - 13) For a given square matrix of order 5, write a script program to carry out of the following:
    - (i) sort each column and store the result in an array B.
    - (ii) sort each row and store the result in an array C.
    - (iii) add each column and store the result in an array D.
    - (iv) add each row and store the result in an array E.
  - 14) For a diagonalizable matrix A, write a function program that returns true if A is positive definite and false otherwise. Also, write a script program to illustrate it.
  - 15) Write a script program that converts a decimal number to its binary, octal and hexadecimal form.
- Group-B** **1 × 8**
- 1) Write a script file to compute the sum of the first  $n$  terms in the series  $5k^2 - k$ ,  $k = 1, 2, 3, \dots, n$ .
  - 2) Write a script program in MATLAB to display all primes numbers between two specified numbers.
  - 3) Write a script program to find all palindrome numbers between two specified numbers.
  - 4) Write a script program to find the value of  $\int_a^b f(x) dx$  by Trapezoidal Rule.
  - 5) Write a script in MATLAB to represent the graphs of the functions  $x(t) = e^{-0.2t} \cos 2t$  and  $y(t) = e^{-0.2t} \sin 2t$ . The text of each equation is properly positioned within the graphs.
  - 6) Write a script in MATLAB to draw the surface and contour of the equation  $z(x, y) = xe^{-x^2-y^2}$  in the range  $-2 \leq x \leq 2$  and  $-3 \leq y \leq 3$  in steps of 0.1.
  - 7) Write a script in MATLAB to find the solution of the following linear equations
 
$$2x + y - 3z = 11$$

$$4x - 2y + 3z = 8$$

$$-2x + 2y - z = -6$$
  - 8) Write a program in MATLAB to convert among decimal, binary, octal, Hexadecimal based on your inputs.



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- 9) Write a script in MATLAB to draw the Pie diagram of a M.Sc. 1st Semester student of the following marks 35, 42, 45, 36, 38, 15
- 10) Write a script program to create a mesh, surface and contour plots of the function  $z = e^{x+iy}$  in the interval  $-1 < x < 1$  and  $-2\pi < y < 2\pi$ . In each case plot the real part of  $z$  versus  $x$  and  $y$ .
- 11) Write a script program to find either minimum or maximum or sum according to your response of the function  $y = xsinx$  in the range  $-\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$  with spacing 0.2 using switch statement.
- 12) Write a script in MATLAB to draw the mesh and surface with contour of the equation  $z = xe^{-x^2-y^2}$  in the range  $-3 \leq x \leq 3$  and  $-3 \leq y \leq 3$ .
- 13) Write a script in MATLAB to draw the following function in the interval  $[-1, 4]$ 

$$f(x) = \begin{cases} x^2 + 1, & -1 \leq x < 0 \\ 0, & x = 0 \\ x^3 + 2x + 5, & x > 0 \end{cases}$$
- 14) Write a script program to solve the following linear equations
 
$$3x + 5y - 6z = 6$$

$$8x - y + 2z = 1$$

$$5x - 6y - 4z = -5$$
 using rref, pinv, and left division methods.
- 15) Write a script in MATLAB to create two lists of numbers and perform the following arithmetic operations on it (i) addition (ii) subtraction (iii) element-wise multiplication (iv) element-wise division.

❖ Viva-Voce:

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