

2022

1st Semester Examination
APPLIED MATHEMATICS
WITH OCEANOLOGY AND
COMPUTER PROGRAMMING

Paper : MTM - 197 (Practical)

(Computational Methods : Using MATLAB)

Full Marks : 25

Time : Two Hours

Select *two* questions on lottery basis. $10 \times 2 = 20$

1. Write a user defined function in MATLAB to calculate the roots of a general quadratic equation. Using it, find the roots of the equation $x^2 + 5x + 6 = 0$.

P.T.O.

2. 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.
3. 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.
4. Write a script program to represent the graphs of the functions $\sin x$, $\sin 2x$ and $\sin 3x$ in $0 \leq x \leq 2\pi$ in same figure on the same axes with different line specifications. Also, put the text in each graph to identify the graphs.

5. Write a script in MATLAB to draw $\sin t$ and $\cos t$ in the interval $[0, 4\pi]$ in the same figure with grid, legend and different line specification.
6. 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.

7. Write a script in MATLAB to draw following parametric equations $x = \sin t$ and $y = \cos t$ in the interval $[0, 2\pi]$ with the center marked by P .
8. Write a script program to create a mesh, surface and contour plots of the function $z = e^{x+iy}$ in the interval $-1 \leq x \leq 1$ and $-2\pi \leq y \leq 2\pi$. In each case, plot the real part of z versus x and y .

P.T.O.

9. 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.
10. Write a script in MATLAB to draw the graph of the following function in the interval

$$[-1, 4] f(x) = \begin{cases} x^2 + 1, & -1 \leq x < 0 \\ 0, & x = 0 \\ x^3 + 2x + 5, & x > 0 \end{cases}$$

11. 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 $\int_0^1 (x^2 + x) dx$.

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 program to find either minimum or maximum or sum according to your response of the function $y = x \sin x$ in the range $-\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$ with spacing 0.2 using switch statement.

14. Write a script in MATLAB to find the two solutions of the following linear equations

$$x + 2y + 3z = 7$$

$$x + y + 4z = 8$$

15. Write a script program that converts a decimal number to its binary, octal and hexadecimal form.

16. Write a script in MATLAB to create a list of numbers and perform the following operations on it (i) find maximum (ii) calculate summation (iii) sort descending order (iv) find norm.

P.T.O.

17. 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.

18. Write a script in MATLAB to create a real matrix and find its eigenvalues and eigenvectors.

19. Write a script in MATLAB to create two matrices of real numbers and perform the following arithmetic operations on it (i) addition (ii) subtraction (iii) multiplication (iv) division.

Notebook + Viva-voce = 3+2
