PG/IS/MTM-197/19 (Pr.)

M.Sc. 1st Semester Examination, 2019

MATHEMATICS

(Lab 1 : *Computational Methods* : *Using MATLAB*)

[Practical]

PAPER—MTM-197

Full Marks : 25

Time : 2 hours

Select **one** question from each Group on **Lottery** basis

The figures in the right-hand margin indicate marks

GROUP – A

Select **one** question on **Lottery** basis : 6×1

1. Write a script in MATLAB to find the sum and the product of all prime factors of a given number.

2. Write a script in MATLAB to create two vectors having same number of elements by two different methods. Then, perform the algebraic operations on these vectors.

3. Write a script in MATLAB to create two different matrices and perform the algebraic operations on these matrices if possible.

4. Write a script in MATLAB to create two matrices from a given matrix such that one matrix contains all the odd rows and another matrix contains all the even rows.

5. Write a script in MATLAB to sort the rows and columns of a given matrix. Then, find the maximum element (without library function) of each row and each column of the given matrix.

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

7. Write a user defined function in MATLAB to generate Fibonacci sequence. Using user defined function find the Fibonacci numbers between two specified numbers.

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

$$x + 2y + 3z = 7$$
$$x + y + 4z = 8.$$

9. Write a script in MATLAB to find the solution of the following linear equations :

$$-x + y = 2$$
$$5x + y = 18$$
$$-6x + 4y = 20.$$

10. 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}.

GROUP – B

Select **one** question on **Lottery** basis : 8×1

11. Write a user defined function in MATLAB to find the real root of the equation $f(x) = 0$ by Newton-Raphson method and using this find a real root of the equation $x^3 + 2x - 5 = 0$.

12. Write a user defined function in MATLAB to find the real root of the equation $f(x) = 0$ by bisection method and using this find a real root of the equation $x^3 + 2x - 5 = 0$.

13. Write a user defined function in MATLAB to calculate correlation coefficient of two sets of numbers. Using this, find the correlation coefficient of the following sets of numbers : {7, 8, 9, 6, 3, 9, 8, 5, 7, 11} and {5, 6, 7, 1, 7, 6, 3, 5, 9, 10}.

14. Write a user defined function in MATLAB to find the value of

$$\int_a^b f(x)\,dx$$

by Trapezoidal rule. Using this find the value of the integral

$$\int_0^1 x\,dx$$

by dividing 100 sub-intervals.

15. Write a user defined function in MATLAB to find the value of

$$\int_a^b f(x)\,dx$$

by Simpson 1/3's rule. Using this find the value of the integral

$$\int_0^1 x^2\,dx$$

by dividing 100 sub-intervals.

16. Write a user defined function in MATLAB to find the mean and median of the following sample : 7, 8, 9, 6, 3, 9, 8, 5, 7, 11.

17. Write a user defined function in MATLAB to find the standard deviation of the sample : 7, 8, 9, 6, 3, 9, 8, 5, 7, 11.

18. Write a user defined function in MATLAB that return true if A is positive definite and false otherwise for any diagonalizable matrix A.

19. Write a program in MATLAB to convert among decimal, binary, octal, Hexadecimal based on your inputs.

20. Write a user defined function in MATLAB to find the factorial of positive integer n. Hence compute ${}^{n}C_{r}$.

GROUP – C

Select **one** question on **Lottery** basis : 6×1

21. Write a script in MATLAB to represent the graphs of the functions $\sin x$, $\sin 2x$ and $\sin 3x$ in the range $(0, 2\pi)$ for x, all on the same axes and different line specification.

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

23. Write a script in MATLAB to represent the graphs of the functions $y = \sin x^2$ and $y = \log\sqrt{x}$. The text of each equation is properly positioned within the graph.

24. Write a script in MATLAB to draw following parametric equations $x = \sin t$ and $y = \cos t$ in the interval $[0, 2\pi]$.

25. Write a script in MATLAB to draw $y = |x|$ in the interval $[-4, 4]$ with mentioning title, axes and *axes limits.*

26. Write a script in MATLAB to draw the following function in the interval $[-1, 4]$:

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

27. Write a script in MATLAB to represent the graph of the curve whose equation in polar coordinates is as follows : $r = \sin 2t \cos 2t$ for t between 0 and 2π.

28. Write a script in MATLAB to draw the surface of the equation $z = x^2 + y^2$ in the range $-3 \le x \le 3$ and $-3 \le y \le 3$.

29. Write a script in MATLAB to draw the surface of the equation $z = xe^{-x^2-y^2}$ in the range $-3 \le x \le 3$ and $-3 \le y \le 3$.

30. Write a script in MATLAB to draw the contour of the equation $z = \sin x + \cos y$ in the range $-2\pi \le x \le 2\pi$ and $0 \le y \le 4\pi$.

[Note Book and Viva : 05 Marks]