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PG (CBCS)
M.Sc. Semester-I Examination, 2023
APPLIED MATHEMATICS
PAPER: MTM 197 (PRCATICAL)
(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 test three specified numbers are in A.P. or not.
3) Write a program that converts a temperature given in Celsius to its equivalent temperature in Fahrenheit.
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 program in MATLAB to find the signature of permutation.
6) Write a program in MATLAB to find the area of a triangle. Use this program to find the area of triangle whose vertices are $(0,5), (0,0), (-5,0)$.
7) 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.
8) Write a script program in MATLAB to display all primes numbers between two specified numbers.
9) Write a script file to compute the sum of the first n terms in the series $2k^3 + 5k, k = 1, 2, 3, \ldots, n$.
10) Write a script program to find all palindrome numbers between two specified numbers.
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 script in MATLAB to create a real matrix and find it eigenvalues and eigen vectors.

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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) 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.

15) 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.

GROUP-B 1×8

1) Write a script program in MATLAB to solve the following ODE and find the value of $f(1)$ using Runge-Kutta method $\frac{dy}{dx} = y - x^2 + 1, y(0) = 0.5$.

2) Write a MATLAB function program to find a real root of the equation $x^2 - sin2x - 1 = 0$ by Newton-Raphson's method.

3) 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 PD^5P^{-1}.

4) 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 $x^2 + 5x + 6 = 0$.

5) 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 $\frac{dy}{dx} = x^2 + y^2, y(0) = 1$.

6) 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 $\int_0^1 x^2 + xdx$

7) Write a script in MATLAB to represent the graphs of the functions $x^2 + y^2 = 1$.

8) 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.

[P.T.O]

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9) Write a script in MATLAB to represent the graphs in the same window of the functions $sinx, sin2x$ and $sin3x$ in the range $(0, 2\pi)$ with mentions different line specification, title, axes and axes limits

10) Write a script in MATLAB to find the solution of the following linear equations

$$2x + y - 3z = 11$$
$$4x - 2y + 3z = 8$$
$$-2x + 2y - z = -6$$

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

13) 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.

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 divison methods.

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

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