Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

IV SEMESTER B. TECH
SPECIAL END SEMESTER EXAMINATION, NOVEMBER 2024
MATLAB FOR ENGINEERS [ELE 4303]

Time: 3 Hours **Date: 28, NOVEMBER 2024** **Max. Marks: 50**

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

Q No.	Question	Marks
1A.	What is the difference between a script and a function in MATLAB, and when would you use each?	***03***
1B.	Write a MATLAB code to create a 1x10 array using colon operator (:), in which the first five numbers are even (between 2 and 10) and last five numbers are odd (between 1 and 9).	***03***
1C.	List any FOUR features of MATLAB that make it particularly useful for engineers in fields such as control systems, signal processing, and data analysis?	***04***
2A.	Write a MATLAB **"for loop"** to iterate through the array A = [2, 4, 6, 8, 10] and display each element multiplied by 3.	***03***
2B.	MATLAB function: **sortrows**(x,n) - Sorts the rows in a matrix 'x' on the basis of the values in column 'n'. The following table gives the finishing time of different skaters in a skating race. Skater Number | 1 | 2 | 3 | 4 | 5 Time (min) | 42 | 43 | 41 | 40 | 45 Write a MATLAB code to sort the table in ascending order, based on the race finishing time.	***03***
2C.	Write a **RECURSIVE** function to search for an element in an unsorted array. Obtain its **TIME COMPLEXITY**.	***04***

3A.	Match the command with its correct description: **Command** 1. plot(x, y, 'r--') 2. plot(x, y, 'LineWidth', 2) 3. plot(x, y, 'o') 4. xlabel('Time (s)') 5. title('Sample Plot') 6. legend('Data 1', 'Data 2')	**Options** A. Adds a title to the plot. B. Plots x and y as a red dashed line. C. Sets the thickness of the line in the plot. D. Plots x and y as circular markers. E. Adds a label to the x-axis. F. Adds a legend for multiple data sets in the plot.	***03***

3B.	The following is the code plot to sinewave in MATLAB:
	
	freq = 0.2*pi;
	w = 2*pi*freq;
	A = 1.25;
	t = linspace(0,pi,10000);
	ft = A * sin(w*t);
	plot(t, ft), title("Sine Wave"),
	xlabel("Time"), ylabel("Sine wave function")
	
	Modify the code to plot only positive values.
			03

3C.	Consider the following code in MATLAB:
	x = '10';
	y = 5;
	z = x + y;
	
	Is the above code VALID or INVALID? Give suitable reasons. If INVALID suggest a way in which the code can be corrected.
			04

4A.	Consider the following MATLAB code:
	
	syms x
	f = x^3 + 4*x^2 - 10*x + 5;
	f_prime = diff(f, x);
	f_double_prime = diff(f_prime, x);
	roots = solve(f == 0, x);
	disp(f_prime);
	disp(f_double_prime);
	disp(roots);
	
	Give the output of each display command after it is executed.
			03

			03

4B. Obtain a smooth sine curve using the following data points:

x	0	45	135	180	225	315	360
y	0	0.7071	0.7071	0	-0.7071	-0.7071	0

MATLAB functions:

y = **polyval**(p,x) evaluates the polynomial p at each point in x. The argument p is a vector of length n+1 whose elements are the coefficients (in descending powers) of an nth-degree polynomial.

p = **polyfit**(x,y,n) returns the coefficients for a polynomial p(x) of degree n that is a best fit (in a least-squares sense) for the data in y. The coefficients in p are in descending powers, and the length of p is n+1.

4C. Example of solving linear equations in MATLAB is given below:

```
syms x y z
eqn1 = 2*x + y + z == 2;
eqn2 = -x + y - z == 3;
eqn3 = x + 2*y + 3*z == -10;
[x y z]=solve(eqn1, eqn2, eqn3);
```

In the similar way write MATLAB code to solve:

The ratio of two numbers is 3/5. If 4 is added to the first and 6 to the second, the ratio becomes the reciprocal of the original ratio. Find the numbers.

04

5A. Explain how MATLAB Simulink can be useful for modeling and simulating dynamic systems in engineering applications. Provide at least two specific examples of how Simulink is beneficial in these scenarios.

03

5B. Give the Simulink block diagram to obtain the step response of the following equation: $\dot{y} = 5f(t) - 7y$

03

5C. List any FOUR toolboxes in MATLAB. Elaborate on how they are useful in your field of work.

04