Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

IV SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, MAY 2023

MATLAB for Engineers [ELE 4303]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date: 02 JUNE 2023** **Max. Marks: 50**

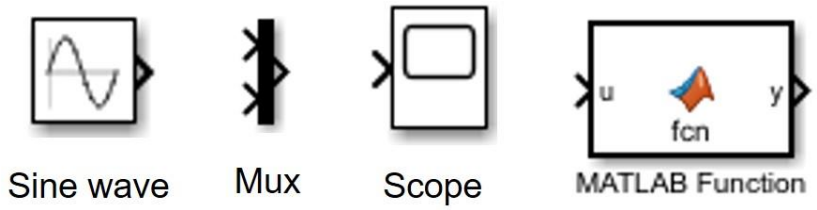
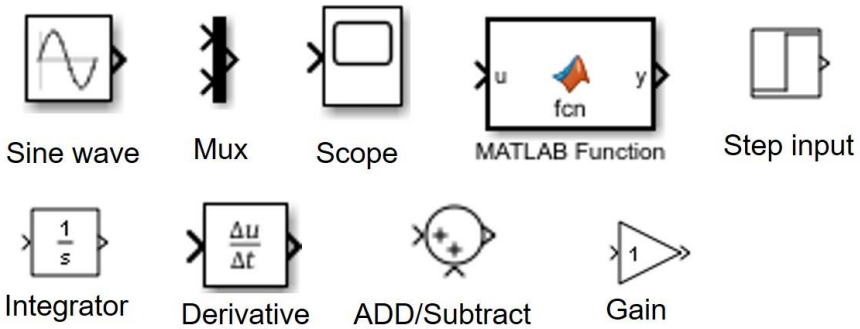
Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.
- Write MATLAB code wherever required.

Q.NO	Questions	Marks	CO	BTL
1A.	List any three typical applications of MATLAB.	(03)	01	01
1B.	$A = \begin{bmatrix} 3 & 7 & -4 & 12 \\ -5 & 9 & 10 & 2 \\ 6 & 13 & 8 & 11 \\ 15 & 5 & 4 & 1 \end{bmatrix}$ Array A is given as above, write MATLAB script to do the following: a) Create a 4×3 array **B** consisting of all elements in the second through fourth columns of **A.** b) Create a 3×4 array **C** consisting of all elements in the second through fourth rows of **A.** c) Find the array product such that **E=C*B**	(03)	01	03
1C.	Create a MATLAB script file to plot an astroid shape on the xy plane over the parametric interval $-2\pi \leq t \leq 2\pi$, where $x\_a = \cos^3(t)$ and $y\_a = \sin^3(t)$. Also, plot the catacaustic of the astroid shape on the same plot over the same range for t: $x = \frac{\cos(t)\,[8 + 5\cos(2t) + 3\cos(6t)]}{13 + 3\cos(4t)}$ $y = \frac{4\sin^3(t)\,[7 + 6\cos(2t) + 3\cos(4t)]}{13 + 3\cos(4t)}$	(04)	CO2	04

	Make sure to use enough points to create smooth curves. Provide a plot title, labels for the axes, and a legend for the two curves.			
2A.	What are classes and objects in MATLAB? What are the components of a 'class' in MATLAB? Explain a suitable example.	***(03)***	***CO1***	***02***
2B.	Create a MATLAB function file using a WHILE LOOP to plot the following function: $y = \begin{cases} sin(x) & for\ 0 \le x < \pi \\ -0.81057x^2 + 7.63944x - 16 & for\ \pi \le x < 2\pi \\ -1.6211x^2 + 25.465x - 96 & for\ 2\pi \le x \le 3\pi \end{cases}$ Illustrate the use of the function within a MATLAB script file.	***(03)***	***CO2***	***04***
2C.	Write a pseudocode RECURSIVE algorithm to reverse the contents of a given array. Illustrate how the contents of a given array can be reversed using basic MATLAB operators.	***(04)***	***CO2***	***04***
3A.	What is the primary data type in MATLAB? How are all numeric variables stored in MATLAB? How to choose the best data type for a given application?	***(03)***	***CO3***	***03***
3B.	Given a complex number C = 10+5i. Convert it to its equivalent polar form using MATLAB functions like abs(__), angle(____), real(__), imag(____), cos(__), sin(__), tan(__), acos(____), asin(__) and atan(__). Multiply C with itself in its polar form and convert the product to its equivalent rectangular form using only MATLAB functions.	***(03)***	***CO3***	***03***
3C.	Plot the values of sine and cosine function for 100 evenly spaced points between from 0 to 3pi the same figure window using SUBPLOT command. Illustrate the use of different color and line styles in the plots.	***(04)***	***CO3***	***03***
4A.	Solve the following puzzle using MATLAB symbolic computation code.	***(03)***	***CO4***	***04***

	Mrs. Benevides leaves Burbank at 9 a.m. and drives west on the Ventura Freeway at an average speed of 50 miles per hour. Ms. Twill leaves Burbank at 9:30 a.m. and drives west on the Ventura Freeway at an average speed of 60 miles per hour. At what time will Ms. Twill overtake Mrs. Benevides, and how many miles will they each have gone? Show necessary equations for solving the puzzle. Write MATLAB symbolic computation code for estimating the time at which Ms. Twill will overtake Mrs. Benevides and how many miles both would have travelled before Ms. Twill overtaking Mrs. Benevides.			
4B.	Current versus voltage characteristics of a white light emitting diode is given in the table below. Current In mA: 5, 10, 20, 30, 40 Voltage in Volts: 1.85, 1.88, 1.93, 1.96, 2.00 Using 1-D data interpolation write a MATLAB code to find: 1) Voltage at 25mA. 2) Current at 1.90 Volts. Description of the MATLAB function for 1-D data interpolation (table lookup) is as follows: vq = **interp1**(x,v,xq) returns interpolated values of a 1-D function at specific query points using linear interpolation. Vector x contains the sample points, and v contains the corresponding values, v(x). Vector xq contains the coordinates of the query points.	***(03)***	***CO4***	***03***
4C.	Current versus voltage characteristics of a white light emitting diode is given in the table below. Current In mA: 5, 10, 20, 30, 40 Voltage in Volts: 1.85, 1.88, 1.93, 1.96, 2.00	***(04)***	***CO4***	***03***

	Using Polynomial curve fitting in MATLAB write a MATLAB code to fit the Current/voltage data to a second order polynomial. Using the polynomial fit find the: 1) Voltage at 25mA. 2) Current at 1.90 Volts. MATLAB functions for reference: 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.			
5A.	Using MATLAB/SIMULINK, 1. Write a MATLAB function to obtain a HALF wave rectified output from a given sine wave. 2. Connect the SIMULINK blocks given below to show both original and rectified output on the display. 	***(03)***	***CO5***	***03***
5B.	The following equation corresponds to transient response of a RC circuit. dVc(t) / dt = (1/RC) [V(t) – Vc(t)] Show the block diagram to simulate the equation using SIMULINK. 	***(03)***	***CO5***	***04***

5C.	List any two MATLAB functions and toolboxes relevant in your field of engineering.	***(04)***	***CO5***	***02***