Roll No. ☐☐☐☐☐☐☐☐☐☐

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. / B. Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, NOV / DEC 2023

B.E. Geoinformatics, Semester VII
GI5703 MATLAB PROGRAMMING AND APPLICATIONS
(Regulation 2019)

Time: 3hrs   Max. Marks: 100

CO 1	To enable the student to understand basic MatLab functions.
CO 2	To enable to solve mathematical problems related to differentiation and integration
CO 3	To enable to solve problems related to Liner and Non Linear equations to correct the same to geospatial algorithms
CO 4	To enable to solve transformations of geospatial problems
CO 5	To make to develop skills in geospatial tool box and map making

BL – Bloom's Taxonomy Levels
(L1 - Remembering, L2 - Understanding, L3 - Applying, L4 - Analysing, L5 - Evaluating, L6 - Creating)
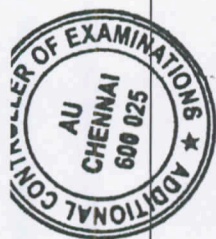
General Instructions
Assume values wherever necessary

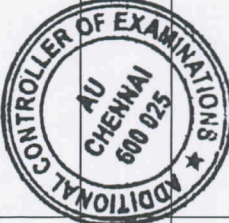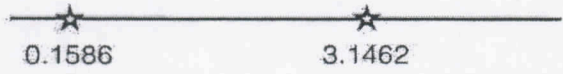### PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

Q. No	Questions	Marks	CO	BL
1	Describe the order of precedence for calculations in MATLAB.	2	1	L1
2	Demonstrate to find determinant, inverse and transpose of a matrix using MATLAB.	2	1	L2
3	Describe the derivation of the equation of velocity from the distance equation and plot it using MATLAB commands	2	2	L1
4	Explain quad and trapz commands.	2	2	L2
5	Describe the function to determine the zero of a function with a syntax.	2	3	L1
6	Infer and explain the bracketing method of solving non-linear algebraic equations.	2	3	L2
7	For the polynomial $f(x) = x^5 - 12.1x^4 + 40.59x^3 - 17.015x^2 - 71.95x + 35.88$: (a) Calculate $f(9)$. (b) Plot the polynomial for $-1.5 \le x \le 6.7$.	2	4	L2
8	Demonstrate the addition and subtraction of two polynomials as given below $f_1(x) = 3x^6 + 15x^5 - 10x^3 - 3x^2 + 15x - 40$ and $f_2(x) = 3x^3 - 2x - 6$	2	4	L2
9	What is the Polyfit function in MATLAB ?	2	5	L1
10	Outline the MATLAB commands for generating linear and logarithmic plots of the vectors x and y.	2	5	L2

Q. No	Questions	Marks	CO	BL
11 (a) (i)	Write a program in a script file that creates an n x m matrix with elements that have the following values. The value of each element in the first row is the number of the column. The value of each element in the first column is the number of the row. The rest of the elements each have a value equal to the sum of the element above it and the element to the left. When executed, the program asks the user to enter values for *n and m*.	8	1	L6
(ii)	Compile and present the following commands with examples. a. fplot b. subplot c. hold d. polyfit e. axis	5		
	OR			
11 (b) (i)	A vector is given by V= [5, 17, -3, 8, 0, -7, 12, 15, 20, -6, 6, 4,-7, 16]. Write and create a program as a script file that doubles the elements that are positive and are divisible by 3 or 5, and raises to the power of 3 the elements that are negative but greater than -5.	5		
(ii)	Create a user-defined function (name it FtoC) that converts temperature in degrees F to temperature in degrees C. Use the function to solve the following problem. The change in the length of an object, ΔL, due to a change in the temperature, ΔT, is given by: $\Delta L = \alpha L \Delta T$, where α is the coefficient of thermal expansion. Determine the change in the area of a rectangular (4.5 m by 2.25 m) aluminum ($\alpha = 23 \times 10^{-6} / \,^{\circ}C$) plate if the temperature changes from 40°F to 92°F.	1 8		L6
12 (a)	Write a note on integration in MATLAB. Write a MATLAB Program to estimate following the integral. $$I = \int_{-1}^{1} \int_{0}^{2} 1 - 6\,x^2\, y\, dx\, dy.$$	13	2	L5
	OR			
12 (b)	The amount M of medication present in the body depends on the rate at which the medication is consumed by the body and on the rate at which the medication enters the body, where the rate at which the medication is consumed is proportional to the amount present in the body. A differential equation for M is $$\frac{dM}{dt} = -kM + p$$ where k is the proportionality constant and p is the rate at which the medication is injected into the body. (a) Determine k if the half-life of the medication is 3 hours.	13	2	L5

	(b) A patient is admitted to a hospital and the medication is given at a rate of 50 mg per hour. (Initially, there is no medication in the patient's body.) Derive an expression for M as a function of time. (c) Plot M as a function of time for the first 24 hours. *Hint: The equation can be solved with the initial condition M = M_0 at t = 0: and you will get $M_t = M_0 / exp(k*t)$.*			
13 (a)	Simplify the process of the fixed point iteration method to solve the nonlinear equation in a single variable and solve the following using the fixed point iteration method. $$2 - x + \ln(x) = 0$$ $$x = 2 + \ln(x) \qquad x = e^{x-2}$$ 0.1586 3.1462	13	3	L4
OR				
13 (b)	Explain the Gauss elimination method to analyze a system of linear equations. Write a MATLAB program to solve the system of linear equations. 5x = 3y - 2z +10; 5y + 4z = 3x + 20; 2x + 4y – 3z = 9	13	3	L4
14 (a)	Develop and display gradient, slope, and aspect of any elevation data of the mountainous region.	13	4	L3
OR				
14 (b)	Construct a methodology with data inputs to develop a landslide hazard zonation map. How will you use MATLAB and disregard the GIS environment to handle these geodata for Landslide Susceptibility Assessment.?	13	4	L3
15 (a)	The average 18-year-old American male weighs 152 pounds. A group of 100 young men were weighed and the data was stored in a file called *weight.dat*. Create a graph (line and histograms) to represent the data. Analyse average, standard deviation, maximum, and minimum Weight.	13	5	L4
OR				
15 (b)	The properties of elements in the same row or column in the periodic table usually display a recognizable trend as we move across a row or down a column. For example, the melting point usually goes down as we move down a column because the atoms are farther apart and the bonds between the atoms are therefore weaker. Similarly, the radius of the atoms goes up as we move down a column because there are more electrons in each atom	13	5	L4

and correspondingly bigger orbitals. Examine the table carefully and plot these trends against atomic weight on the same graph.

Table 15.1 Group I Elements and Selected Physical Properties

Element	Atomic Number	Melting Point, °C	Atomic Radius, pm
Lithium	3	181	0.1520
Sodium	11	98	0.1860
Potassium	19	63	0.2270
Rubidium	37	34	0.2480
Cesium	55	28.4	0.2650

PART- C (1 x 15 = 15 Marks)
(Q.No.16 is compulsory)

Q. No	Questions	Marks	CO	BL
16. (i)	Examine and plot the contour for any given DEM using MATLAB.	8	4	L4
(ii)	Infer and represent the following with an example in MATLAB a) Subplots b) Polar plots c) Bar graphs and Pie charts d) Histograms	7	5	L3