

2023

B.E. (Mechanical), First Semester
ESC-X02: Computer Programming (MATLAB)

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Unit.

x-x-x

1. (i) What do you understand by the term string? (2)
- (ii) How can the information be obtained regarding variables stored in the workspace? (2)
- (iii) Is it possible to customize plots? If yes, how? (2)
- (iv) Write a command to draw multiple plots in the same graph (2)
- (v) The surface area A of a sphere depends on its radius r as follows: $A = 4\pi r^2$. Write the script file that prompts the user to enter a radius, computes surface area, and displays the result in a diary reading everything in script file (2)

UNIT - I

2. Code the function $y(x) = \frac{\sin(x)}{x}$ as an inline function **sinc** and in a function file called **sincfun.m**. You will use this function in the input list of **ezplot** in various ways in the following instructions:
 - Use the inline function **sinc** in the input list of **ezplot** to plot the function over the default domain.
 - Use the function **sincfun** as a string in the input list of **ezplot** to plot the function over the default domain.
 - Create a function handle for **sincfun** and use the handle in the input list of **ezplot** to plot the function over the default domain.
3. Create a 10×10 random matrix with the command $A = \text{rand}(10)$. Now do the following operations:
 - Multiply all elements by 100 and then round off all elements of the matrix to integers.
 - Replace all elements of $A < 10$ with zeros.
 - Replace all elements of $A > 90$ with infinity.
 - extract all $30 \leq a_{ij} \leq 50$ in a vector b , that is, find all elements of A that are between 30 and 50 and put them in a vector b .
4. The height and speed of a projectile launched with a speed of v_0 at an angle A to the horizontal are given by

$$h(t) = v_0 t \sin A - 0.5gt^2$$

$$v(t) = \sqrt{v_0^2 - 2v_0gt \sin A + g^2t^2}$$

where g is the acceleration due to gravity. The projectile will strike the ground when $h(t) = 0$, which gives the time to hit, $t_{hit} = 2 \left(\frac{v_0}{g} \right) \sin A$. Suppose $A = 40^\circ$, $v_0 = 20m/s$, $g = 9.81m/s^2$. Use the MATLAB relational and logical operators to find the times when the height is no less than $6m$ and speed is simultaneously no greater than $16m/s$.

(2x10)

P.T.O.

(2)

UNIT - II

5. Solve the equation

$$(x - 3)(x + 5) = 5$$

with the help of MATLAB function FZERO

6. Use QUAD function to integrate the following

$$\int_{-\infty}^{\infty} e^{-\frac{x^2}{2}} dx$$

7. Use MATLAB to solve following fourth-order differential equation

$$\frac{d^4y}{dt^4} + 5\frac{d^3y}{dt^3} + 7\frac{d^2y}{dt^2} + 6\frac{dy}{dt} + 7y = 8$$

Choose your own initial conditions

(2x10)

x-x-x