## **RAJAGIRI SCHOOL OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)**

**Department of Computer Science & Business Systems**

**101009/IT700B IT WORKSHOP – MATLAB**

**2021-25 Batch-Lab Cycle**

**Experiment 1. Programs using mathematical, relational expressions, and operators**

**Basic Mathematical Operations**

Write a MATLAB script that:

* Defines two variables ‘a’ and ‘b’ with values 5 and 3, respectively.
* Computes and displays the sum, difference, product, and quotient of ‘a’ and ‘b’.
* Uses relational operators to compare ‘a’ and ‘b’ and displays the results of the comparisons (e.g., a>b, a==b, etc.).

**Complex Mathematical Expressions**

Write a MATLAB script that:

* Defines three variables x=2, y=4, and z=6.
* Computes the value of the expression f(x,y,z)=x2+y2−z2+√xy and displays the result.

**Experiment 2. Vectors and Matrices: Programs using array operations and matrix operations**

**Vector Operations**

Write a MATLAB script that:

* Creates two vectors A=[1,2,3] and B=[4,5,6].
* Computes and displays the dot product and cross product of vectors ‘A’ and ‘B’.

**Matrix Operations**

Write a MATLAB script that:

* Creates two matrices M1=[1,2;3,4] and M2=[5,6;7,8].
* Performs and displays the result of matrix multiplication M1×M2,inverse of M1,Transpose of M2,matrix concatenation, Determinant of M2

**Experiment 3. Programs on input and output of values**

**User Input and Output**

Write a MATLAB script that:

* Prompts the user to enter two numbers.
* Calculates the sum, difference, product, and quotient of the two numbers.
* Displays the results in a formatted manner
* Prompts the user to enter strings and try out the string functions for Concatenation, String Comparison, Substring Operations, Case Conversion, **String Length and Splitting,** Padding and Trimming, **Pattern Matching and Replacement**

**Matrix Input and Output**

Write a MATLAB script that: (don’t use loop to enter the values)

* Prompts the user to enter the elements of a 2x2 matrix.
* Displays the entered matrix and its transpose.

**Experiment 4. Selection Statements: Experiments on if statements, with else and elseif clauses and switch statements**

**Grade Classification**

Write a MATLAB script that:

* Prompts the user to enter a score (0-100).
* Uses if-else and elseif statements to classify the score into grades (A, B, C, D, F) and displays the corresponding grade.
* Prompts the user to enter the coefficients of the quadratic equation and calculate the roots

**Using Switch Statement**

Write a MATLAB script that:

* Prompts the user to enter the choice (to calculate the area or perimeter)and the radius of the circle
* Uses a switch statement to perform the corresponding operation and displays the result.

### Experiment 5. Loop Statements and Vectorizing Code: Programs based on counted (for) and conditional (while) loops

#### Summation using For Loop

Write a MATLAB script that:

* Computes the sum of the first ‘n’ natural numbers using a for loop, where ‘n’ is provided by the user.
* Displays the result as matrix.

#### Factorial Calculation using While Loop

Write a MATLAB script that:

* Computes the factorial of a number ‘n’ using a while loop, where ‘n’ is provided by the user.
* Displays the result.

#### Vectorized Operations

Write a MATLAB script that:

* Creates a vector x=[1,2,3,…,10]
* Computes and displays the square of each element in the vector using vectorized operations.

### Experiment 6. Programs on Built-in text manipulation functions and conversion between string and number types

#### Text Manipulation

Write a MATLAB script that:

* Prompts the user to enter a string.
* Converts the string to uppercase and lowercase.
* Displays the results.

#### String to Number Conversion

Write a MATLAB script that:

* Prompts the user to enter a numerical string.
* Converts the string to a number.
* Performs an arithmetic operation (e.g., adds 10 to the number) and displays the result.

#### Counting Vowels in a String

Write a MATLAB script that:

* Prompts the user to enter a string.
* Uses built-in functions to count the number of vowels (a, e, i, o, u) in the string.
* Displays the count of each vowel.

### Experiment 7. Programs based on scripts and user-defined functions

#### Simple Script and Function

Write a MATLAB script that:

* To read the range
* Print all the prime numbers with in a range.

Write a MATLAB script that:

* Reads a number
* Check of the number is a Pythagorean triplet using function

*Hint:The set of numbers (3, 4, 5) is called a* ***Pythagorean triple****, meaning the three positive integers satisfy the equation: a2+b2=c2*

#### Function to Compute Fibonacci Sequence

Write a MATLAB script that:

* Defines a function fibonacci to compute the first ‘n’ terms of the Fibonacci sequence.
* Prompts the user to enter ‘n’, calls the function, and displays the sequence

### Experiment 8. Programs based on Advanced Plotting Techniques

#### Subplots

Write a MATLAB script that:

* Creates a figure with two subplots, the first subplot, plots a sine wave, the second subplot, plots a cosine wave.
* Represent the sine and Cosine waves as two graphs in the same figure
* Adds titles, labels, and legends to the plots.

#### 3D Plotting

Write a MATLAB script that:

* Generates a mesh grid of ‘x’ and ‘y’ values.
* Computes z=sin(√(x2+y2)).
* Creates a 3D surface plot, line and scatter plot of ‘z’.
* Adds titles, labels, and color bar.

Write a MATLAB script that:

* Plots a sphere [x(t,s),y(t,s),z(t,s)]=[cos(t)cos(s),cos(t)sin(s),sin(t)] where [t,s]=[0,2pi]
* Adds titles, labels, and proper titles.

### Experiment 9. Programs based on two main data structures: cell arrays and structures

#### Cell Array Manipulation

Write a MATLAB script that:

* Has the cell array C = {3.14, 'MATLAB', true; 7, [1 2 3], 'hello'}
* Access and display the second element of the first row.
* Replace the third element of the second row with a new matrix [4 5 6].
* Modify the content of the first cell to store a structure containing information about a student (name, age, GPA). Display the updated cell array.

#### Structures

Write a MATLAB script that:

* Defines a structure array to store information about three students, including fields for Name, Age, and marks of 4 subjects.
* Adds data for each student.
* Computes and displays the average grade of each student along with name. Generate a ranklist and store it in another structure and display it.

### Experiment 10. Programs based on Advanced Functions

#### Anonymous Functions and Function Handles

Write a MATLAB script that:

* Defines an anonymous function to compute the square of a number.
* Creates a function handle to the anonymous function.
* Uses the function handle to compute and display the square of a user-provided number.

#### Nested Functions

Write a MATLAB script that:

* Defines a main function to compute the area of a rectangle.
* Within the main function, defines a nested function to compute the perimeter of the rectangle.
* Prompts the user for the length and width of the rectangle.
* Call the nested function to compute the perimeter and the main function to compute the area, then displays both results.