# DHANAMANJURI UNIVERSITY
# DECEMBER 2025

**Name of Programme : B.A./B.Sc. Mathematics**
**Semester : 5th**
**Paper Type : SEC**
**Paper Code : SMA-009**
**Paper Title : MATLAB**
**Full Marks : 40**
**Pass Marks : 16** **Duration: 2 Hours**

***The figures in the margin indicate full marks for the corresponding questions.***
***Answer all questions:***

**1. Choose the correct answer from the following and rewrite it :** $1 \times 3 = 3$

(i) Which command displays the workspace variables?

(a) which
(b) what
(c) who
(d) whose

(ii) Which of the following saves workspace variables to a file myvar.mat?

(a) save myvar.mat
(b) write myvar.mat
(c) store myvar.mat
(d) export myvar.mat

(iii) Which of the following finds the eigenvalues of a matrix $A$?

(a) eig(A)
(b) eigen(A)
(c) eigenvalue(A)
(d) eigenvalues(A)

(iv) Which MATLAB function is used to find forward difference?

(a) forwarddiff()

(b) fdiff()

(c) diff()

(d) fdifference()

**2. Write very short answer for each of the following:** **$1 \times 6 = 6$**

(a) Write MATLAB command to generate 11 evenly spaced points between 0 and 1?

(b) Write MATLAB command to plot a histogram of a data vector x with 10 bins.

(c) Write syntax of if-else-if-else statement in MATLAB.

(d) What does the `continue` statement do in a loop?

(e) What is the purpose of `input` function in MATLAB?

(f) Write the syntax of `ode45` function in MATLAB.

**3. Answer any two from the following:** **$4 \times 2 = 8$**

(a) Write MATLAB program to plot the graph of the functions $y_1 = \sin x$ and $y_2 = \cos x$ in the interval $[0, 2\pi]$ with different colors and line styles. Display x-label as 'x axis', y-label as 'y axis', title of the plot as 'Plot of sine and cosine functions' and legend as 'sin(x)' and 'cos(x)'.

(b) Write a MATLAB program to take a number from 1 to 7 from a user and display the corresponding day of the week using the switch statement.

(c) Write a MATLAB program to compute the cosine of an angle entered in degrees by the user using the following series.

$$\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} + \dots$$

The program should terminate if a negative angle is entered. Prompt the user to enter the number of terms to add. Display the computed cosine value along with percentage error.

(d) Write a MATLAB recursive function to find the square root of a positive number $N$ with initial guess $x_0$.

**4. Answer any two from the following:** **$6 \times 2 = 12$**

(a) Write a MATLAB function to find the numerical integral of the function $f(x) = \sin x$ by Simpson's one-third method in the interval $[0, \pi]$ by making 10 subdivisions. Use your function to compute the integral. Use a MATLAB built-in function to compute the same integral. Which one will be more accurate?

(b) Write a MATLAB function to find the root of $f(x) = x^3 - 4x - 9$ by the Secant method in the interval $[2, 3]$ with a tolerance of $0.0001$ and maximum iteration 50. Use your function to compute the root. Use a MATLAB built-in function to compute the same root.

(c) Write a MATLAB function to find the solution of a system of linear equations by Gauss elimination method with partial pivoting. Use your function to compute the solution of the system of equations whose coefficient matrix $A = \begin{bmatrix} 2 & 1 & -1 \\ -3 & -1 & 2 \\ -2 & 1 & 2 \end{bmatrix}$ and right-hand side vector $B = [8, -11, -3]$.

(d) Write a MATLAB function to find the solution of a first order ODE:

$$\frac{dy}{dt} = -2ty, \quad y(0) = 1$$

using Runge-Kutta method of order 4. Use your function to determine the solution curve in the interval $[0, 1]$. Plot your solution together with the actual solution for comparison.

*****