THE OPEN UNIVERSITY OF SRI LANKA

B.Sc/B.Ed Degree Programme

Applied Mathematics – Level 05

ADU5320 – Introduction to MATLAB Software

OPEN BOOK TEST (OBT) – 2023/2024

DURATION: ONE (01)–HOUR

Date: 05.01.2024   **Time: 04.00 p.m.-05.00 p.m.**

ANSWER **ALL** QUESTIONS

1. i) Determine whether each of the following questions is either true or false. **Provide reasons if your answer is false.**

     a. Command used to display the value of variable x is `disp x` .   (05 points)

     b. MATLAB shows an error if we don't assign a variable to an expression that evaluates a numerical value.   (05 points)

     c. Suppose matrix A is given by

$$A = \begin{bmatrix} 3 & 2 & 2 \\ 2 & 3 & 1 \\ 3 & 1 & 3 \end{bmatrix}$$

     Then `A(2:3,:)` command gives the second row and the third column of the matrix A.

                                                           (05 points)

     d. The MATLAB command of the expression $y = e^{-a}\sin(x) + 10\sqrt{x}$ is

     $y = e^{\wedge}(-a) * sin(x) + 10 * \sqrt{x}$ (05 points)

     e. Radians is the return type of trigonometric functions in MATLAB.   (05 points)

ii) Write a MATLAB function file that converts temperature in degrees Fahrenheit (°F) to degrees Centigrade (°C). Assume you type the codes in M-file. The temperature conversion formulation is $C = 5/9 * (F - 32)$.

     a. Use `input` command to request temperature in Fahrenheit from the user.   (10 points)

     b. Use `fprintf` command to display a text message with the temperature in Centigrade.

                                                                      (15 points)

2. i) Let $y(t) = y_0 - \frac{1}{2}gt^2 + (v_0 \sin \theta_0)t$

$x(t) = x_0 + (v_0 \cos \theta_0)t$

where $y(t)$ is the vertical distance and $x(t)$ is the horizontal distance traveled by the projectile in metres, g is the acceleration due to Earth's gravity $= 9.8 \ m/s^2$ and t is time in seconds. Let us assume that the initial velocity of the projectile $v_0 = 50.75 \ m/s$ and the projectile's launching angle $\theta_0 = 5\pi /12$ radians. The initial vertical and horizontal positions of the projectile are given by $y_0 = 0$ m and $x_0 = 0$ m.

a. Write MATLAB commands to plot $y(t)$ vs. t and $x(t)$ vs. t in two separate graphs with the vector $t = 0:0.1:10$ representing time in seconds.   (15 points)

b. Write commands to label the x axis and y axis and to add titles to the graphs.   (05 points)

c. Write a user-defined MATLAB function to calculate the value of $x(t)$ at the point $t = 10$.

(10 points)

ii) Consider the following matrix.

$$A = \begin{bmatrix} 1 & 2 & 0 \\ 0 & 2 & 1 \\ 2 & 3 & 0 \\ 5 & 1 & 1 \end{bmatrix}$$

a) Write a MATLAB code to obtain the above matrix.   (05 points)

b) Create a submatrix B consisting of row 2 and 3 and column 1 and 2 of the matrix A.

(10 points)

c) Delete the second column of matrix B.   (05 points)

****** End of the Question Paper*******

2