

Nirma University

Institute of Technology

Semester End Examination, December - 2020

B.Tech., Semester – V(Open Elective)

2ECO76: MATLAB for Engineers

Roll /

Exam No.

Time: 1.5 Hours

Supervisor's initial

With date

Max. Marks: 40

- Instructions:
1. Attempt all questions.
 2. Figure to right indicate full marks.
 3. Draw neat sketches wherever necessary.
 4. Assume suitable data wherever necessary.

Q.1 (A) Write a MATLAB code which generates the following function. (05)

$$\begin{aligned} y(t) &= 3t^2 - 2t + 6 \quad \text{for } t < -5 \\ &= 4t^2 - 3t + 5 \quad \text{for } -5 \leq t \leq 5 \text{ at step size } 1 \\ &= 4t + 17 \quad \text{for } t > 5 \end{aligned}$$

OR

(A) Write a MATLAB code which generates the following function. (05)

$$y(2j) = \frac{x(j) + x(j-1)}{2} \text{ and } y(2j-1) = \frac{x(j) - x(j-1)}{2}$$

Where the given array $x = [2, 7, 10, 5, 4, 8, 7, 6, 3, 14]$.

(B) Write a MATLAB program that accepts a string from a user with the input function, chops that string into a series of tokens, sorts the tokens into ascending order, and prints them out. (05)

(C) Write a MATLAB program that returns the following plots: (10)

1. $y_1 = \sin(x)$ versus x
 2. $y_2 = \cos(x)$ versus x
 3. $y_3 = [\sin(x) + \cos(x)]$ versus x
 4. $y_4 = [\sin(x) - \cos(x)]$ versus x
- over the range $0 \leq x \leq 2\pi$ using the following specs:
1. Twenty points to create each plot
 2. Label the x - and y -axis
 3. Choose color, markers, and line style for each curve
 4. Create the continuous plots in the same figure window with a grid
 5. Limit the plotting range over $1.5 \leq y \leq -2$
 6. Remove the axis
 7. Identify each curve by a text string
 8. Also, plot each curve in an individual subwindow

Q.2 (A) Create a 3-D plot in MATLAB from a 2-D, 11×11 matrix (in the xy plane) having ones along the main diagonals, zeros everywhere else, with the center element having a magnitude of 2. It is desired that the zx planes indicate the magnitudes of the elements position on the xy plane all having triangular shapes. (05)

OR

- ✓ (A) Create the MATLAB script file that performs the operations indicated (05)
as follows:

$$A = \begin{bmatrix} 3e^{j\pi/3} & 6\cos\left(\frac{\pi}{6}\right) + i6\sin\left(\frac{\pi}{6}\right) \\ 3 + 4i & 4.23e^{(-i\pi/18)} + 9 \end{bmatrix} \quad B = \begin{bmatrix} 5 - 9j & 5e^{j(\pi/3 + \pi/5)} \\ (2 - 3j)^{3.3} & \log(6 - 8j) \end{bmatrix}$$

1. $C = \text{determinant of } A$
2. $D = \text{conjugate of } A$
3. $E = \text{square of } A$
4. $F = A.^B$
5. $G = \text{Transpose of } A$

- (B) If there is a group of n people in a room, then write a MATLAB program (05)
that calculates the probability that two or more of n people will have
the same birthday, where n is a calling argument.

(Hint: To do this, the function should create an array of size n and generate n birthdays in the range 1 to 365 randomly. It should then check to see if any of the n birthdays are identical. The function should perform this experiment at least 5000 times and calculate the fraction of those times in which two or more people had the same birthday.)

- ✓ (C) Write a MATLAB function that will accept a structure array of student (05)
and calculate the final average of each one, assuming that all exams
have equal weighting. Add a new field to each array to contain the
final average for that student, and return the updated structure to
the calling program. Also, calculate and return the final class average.

- ✓ (D) Write a MATLAB function that will accept a cell array of strings and (05)
sort them into ascending order according to *alphabetical order*. (This
implies that you must treat 'A' and 'a' as the same letter.)