International University - VNUHCM
School of Electrical Engineering

Sample Exam

QUESTIONS

Q1. Random functions (20 marks)

Give the MATLAB commands to generate the followings (save all your commands in a script and name it *yourfullname_Q1.m*, i.e., NguyenNgocTruongMinh_Q1.m):

a. A random integer number from 1 to 20 (1 mark)

b. A random odd integer number from 11 to 99 (2 marks)

c. A random even integer number from -50 to 50 (2 marks)

d. A random integer number from 10 to 99 and divisible by 3 (2 marks)

e. A random float number from 6.3 to 36.6 (1 mark)

f. A random float number from -18.9 to 66.3 (2 marks)

g. A row vector with 10 random integer elements from 23 to 78 (2 marks)

h. A column vector with 15 random float elements from 1.1 to 9.9 (2 marks)

i. A matrix 3x4 with random integer elements from -25 to 25 and divisible by 5 (3 marks)

j. A matrix 6x6 with first three columns are random integers from 3 to 30, last three columns are random floats from 2.4 to 6.9 (3 marks)

Q2. Vectors (10 marks)

Give the MATLAB commands to perform the followings (*yourfullname_Q2.m*):

a. Create a row vector that goes equal steps from -5 to 5 containing 50 components (2 marks)

b. Create a row vector spanning the range from 0 to 2π, containing 100 equally spaced components, so that the first value is 0, and the last value is 2π (2 marks)

c. Create a column vector with 50 values which are sine of equally spaced components ranging from 0 to π (3 marks)

d. Create a 10x10 matrix, so that the odd columns should contain values 3, and the even columns, values 0 (3 marks)

Q3. (10 marks)

Write a MATLAB script file (*yourfullname_Q3.m*) to create the following matrix A with the input N is prompted from the command window:

$$A = \begin{bmatrix} 1 & 1 & 1 & 1 & \dots & 1 \\ 1 & 2 & 4 & 8 & \dots & 2^N \\ 1 & 3 & 9 & 27 & \dots & 3^N \\ 1 & 4 & 16 & 64 & \dots & 4^N \\ \dots & \dots & \dots & \dots & \dots & \dots \\ 1 & N & N^2 & N^3 & \dots & N^N \end{bmatrix}$$

$$A = \begin{bmatrix} 1^0 & 1^1 & 1^2 & 1^3 & \dots & 1^N \\ 2^0 & 2^1 & 2^2 & 2^3 & \dots & 2^N \\ 3^0 & 3^1 & 3^2 & 3^3 & \dots & 3^N \\ 4^0 & 4^1 & 4^2 & 4^3 & \dots & 4^N \\ \dots & \dots & \dots & \dots & \dots & \dots \\ N^0 & N^1 & N^2 & N^3 & \dots & N^N \end{bmatrix}$$

Q4. (10 marks)

As π is the sum of the following series:

$$\pi = \sum_{n=0}^{\infty} 16^{-n}\left(\frac{4}{8n+1} - \frac{2}{8n+4} - \frac{1}{8n+5} - \frac{1}{8n+6}\right)$$

We can calculate an approximation of π by summing the first n terms of this series, with n is very large. Write a MATLAB function (*yourfullname_Q4.m*) that calculates the value of π based on the input n.

Q5. (15 marks)

Given the following system of linear equations:

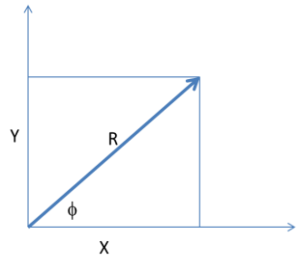
$$\begin{cases} 2x - 3y + 5z = 2 + t \\ -x - 2y + 3z + 4t = 0 \\ 3x + 8y - 5z + 3t = -2 \\ -4y + 2z - 7t = 9 \end{cases}$$

$$\begin{cases} 2x - 3y + 5z - t = 2 \\ -x - 2y + 3z + 4t = 0 \\ 3x + 8y - 5z + 3t = -2 \\ -4y + 2z - 7t = 9 \end{cases}$$

Write a MATLAB script file (*yourfullname_Q5.m*) to compute the solution for x, y, z, and t.

Q6. (20 marks)

Write a MATLAB function (*yourfullname_convertRtoP.m*) to convert from Rectangular Coordinate to Polar Coordinate system.



The relationship is given by the following equations:

$$X = R\cos(\varphi) \text{ and } Y = R\sin(\varphi)$$

$$R = \sqrt{X^2 + Y^2} \text{ and } \varphi = tan^{-1}\frac{Y}{X}$$

Write a MATLAB script (*yourfullname_Q6.m*) to call this function. In this script, the input X is the 3 first digits of your student ID number with one significant and two decimal digits, Y is the 2 last digits of your student ID number with one significant and one decimal digit.

For example: your student ID number is $EEEEIU12345$, then $X = 1.23;\ Y = 4.5$)

Q7. (15 marks)

Write a MATLAB script file (*yourfullname_Q7.m*) that computes and plots the following functions as a function of time.

$$Y_1(t) = Asin(2\pi ft + \varphi)$$
$$Y_2(t) = Acos(\pi ft)$$
$$Y_3(t) = 5cos(4\pi ft + \varphi)$$
$$Y_4(t) = 4sin(6\pi ft)$$

Assume a frequency $f = 5Hz$, an amplitude of $A = 1.5$, a phase angle $\varphi = 300^{\circ}$ and the time t is ranging from 0 to 30 seconds with a step of 0.1.

a. Plot 4 functions in a same figure

b. Plot 4 functions in 4 sub-plots

Add figure title, legend, axis titles, gridlines, linewidth = 1.5, marker shapes and colors are optional.

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