ENGR15100: SOFTWARE TOOLS FOR ENGINEERS

Laboratory 2

PURPOSE: Practice of matrix and vector definition in MATLAB.

For each problem, create a MATLAB script file and name it FIRSTNAME_LASTNAME_LAB2__ problemX.m. Put ALL the commands for the required steps in your script file:

- Be sure to clear the display and the memory.
- Display your name.
- Separate and label different steps using comments.

You can use following template for each of the Problem.

```
%{
Class       : ENGR15100: Software Tools for Engineers
Instructor  : Xiaoli Yang
Author      : [Student's Name]
Assignment  : Lab [No.]
File Name   : Firstname_Lastname_LAB[No.]_Problem[No.].m
              (eg: Xiaoli_Yang_LAB1_Problem1.m)
Date        : [MM]/[DD]/[YY]
%}

%clear screen
clc

%clear workspace
clear

%display your name
disp('Your Full Name Here');
disp('Starting code: ');

%Start your source code here%

%End your code
disp('Completed');
```

SUBMITTING YOUR LAB:
Submit your lab by uploading .m file using the Brightspace Assignment feature no later than the date specified.

PROBLEM 1: Creating Vectors in MATLAB (30 points)

Save all the commands for the following steps in your script file. Separate and label different steps using comments. Unless otherwise specified, do NOT suppress MATLAB's output in the following steps.

(1) Create a vector variable $vector\_1 = [10 \quad 15 \quad 26 \quad 47]$

(2) Create a vector variable $\text{vector\_2} = \begin{bmatrix} 2 \\ 8 \\ 28 \\ 182 \end{bmatrix}$

(3) Create a vector variable $\text{vector\_3} = \begin{bmatrix} 3.14 \\ 2.72 \\ 1.41 \\ 1.73 \end{bmatrix}$

(4) Create variables *a*, *b*, and *c*. Assign the scalar values *5*, *−3.75*, and $\pi/3$ to variables *a*, *b*, and *c*, respectively. Create a vector variable $vector\_4$, based on the created variables. (hint: factorial(x), abs(x))

$vector\_4 = [a \quad b \quad c \quad a! \quad |b| \quad sign(b) \quad round(88c) \quad fix(b)]$

(5) Create a vector variable $vector\_5$, based on the variables created in step (4) and their computations (hint: exp(x))

$$vector\_5 = \begin{bmatrix} -9.86 \\ 4.45 \\ sin(b/c) \\ e^{\sqrt[a]{2.6a+9.3c}} \\ ceil(b) \\ floor(b) \end{bmatrix}$$

PROBLEM 2: Creating Vectors in MATLAB (20 points**)**

Save all the commands for the following steps in your script file. Separate and label different steps using comments. Unless otherwise specified, do NOT suppress MATLAB's output in the following steps.

(1) Create a vector variable $vector\_1 = [5 \quad 4.8 \quad \ldots \quad -4.8 \quad -5]$ by using the MATLAB ***colon (:) operator***.

(2) Create an evenly spaced vector variable $vector\_2$. The first and last elements of $vect\_2$ should have the values 0 and 16, respectively. The number of elements of $vect\_2$ should be the same as that of $vector\_1$. Accomplish this step with one line of code using a combination of two built-in functions ***linspace*** and ***length***.

PROBLEM 3: Creating Matrix in MATLAB (50 points)

Save all the commands for the following steps in your script file. Separate and label different steps using comments. Unless otherwise specified, do NOT suppress MATLAB's output in the following steps.

(1) Create a matrix variable $matrix\_1$ such that

$$matrix\_1 = \begin{bmatrix} 924 & 561 & 192 \\ -991 & -221 & 807 \\ 550 & -771 & 150 \end{bmatrix}$$

(2) Create a matrix variable $matrix\_2$ such that $matrix\_2 =$

$$\begin{bmatrix} 3.58 & -10.79 & 100 & pi/2 & eps & -8.375 & 20 & 8.5 & 88.88 & -1000 \\ -20 & -14.4444 & -8.8889 & -3.3333 & 2.2222 & 7.7778 & 13.3333 & 18.8889 & 24.4444 & 30 \\ -600 & -500 & -400 & -300 & -200 & -100 & 0 & 100 & 200 & 300 \\ -40 & -36 & -32 & -28 & -24 & -20 & -16 & -12 & -8 & -4 \\ 0 & 1.1111 & 2.2222 & 3.3333 & 4.4444 & 5.5556 & 6.6667 & 7.7778 & 8.8889 & 10 \end{bmatrix}$$

Utilize the MATLAB ***colon (:) operator*** and ***linspace*** whenever possible.

(3) Create a matrix variable $matrix\_3$, a 9 x 9 matrix full of 2's, by using the built-in function ***ones***, such that

$$matrix\_3 = \begin{bmatrix} 2 & \dots & 2 \\ \vdots & \ddots & \vdots \\ 2 & \dots & 2 \end{bmatrix}$$

(4) Create a matrix variable $matrix\_4$, a 9 x 9 matrix of all zeros, but with the values [1 2 3 4 5 4 3 2 1] on the main diagonal, by using the built-in function ***diag***, such that

$$matrix\_4 = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 3 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 4 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 5 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 4 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 3 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$