**ENED 1090: Engineering Models I**

**Homework Assignment #3**

**Due: Week of September 21st at the beginning of your Recitation Section**

**Problem 1: To Dot or Not To Dot**

The purpose of this problem is to help you understand when the entry by entry operators are required and when they are not required. ***In each part of this problem, you should only use the entry by entry operator when it is needed or you will lose points.***

Some Guidelines:

* Never use .+ or .-
* When you are multiplying or dividing an array by a scalar (single constant value), you DO NOT NEED the entry by entry operator.
* When you have an array of values and you want to raise each entry in the array to a power, you DO NEED the entry by entry operator (.^).
* When you have two different arrays and you want to multiply or divide each entry in one array by the corresponding entry in the second array, you DO NEED the entry by entry operator (.\* or ./). The two arrays must be exactly the same size for this to work!

Create the following 1-d arrays in MATLAB: x = [ 1 0 3 6] and y = [2 4 6 8]

1. What MATLAB command will multiply each entry in y by 6?

>> 6\*y

ans =

12 24 36 48

1. What MATLAB command will divide each entry in x by 100?

>> x/100

ans =

0.0100 0 0.0300 0.0600

1. What MATLAB command will subtract 73 from each entry in y?

>> y - 73

ans =

-71 -69 -67 -65

1. What MATLAB command will take each entry in x and raise it to the 5th power?

>> x.^5

ans =

1 0 243 7776

1. What MATLAB command will invert each entry in y?

>> 1./y

ans =

0.5000 0.2500 0.1667 0.1250

1. What MATLAB command will evaluate the function x3+2x2+3x+ 5 for every entry in x?

>> x.^3 + 2\*(x.^2) + 3\*x + 5

ans =

11 5 59 311

1. What MATLAB command will add each entry in x to the corresponding entry in y?

>> x + y

ans =

3 4 9 14

1. What MATLAB command will multiply each entry in x by the corresponding entry in y?

>> x.\*y

ans =

2 0 18 48

**Problem 2: I/O statements**

Write a script file that will do the following:

* Prompt the user for Name, Age, City, State, and Zip Code using a series of input statements
* Uses fprintf statement(s) to output the information entered by the user
* Uses a menu statement to ask the user if the information entered is correct. *Note: there will be no code following this menu statement.*

**Run your script and paste the resulting output as well as the MATLAB commands below:**

**Script:**

%Problem 2

clear;

%Input

Name = input('Please enter your full name: ','s');

Age = input('Please enter your age: ','s');

City = input('Please enter your city of residence: ','s');

State = input('Please enter your state of residence: ','s');

Zip\_Code = input('Please enter you zip code: ','s');

%Output

fprintf('Your name is %s.\n',Name);

fprintf('Your age is %s.\n',Age);

fprintf('You live in the city %s.\n',City);

fprintf('You live in the state %s.\n',State);

fprintf('Your zip code is %s.\n',Zip\_Code);

Verify\_Info = menu('Is this information correct?','Yes','No');

**Output:**

Please enter your full name: Jonathan Kenney

Please enter your age: 18

Please enter your city of residence: Cincinnati

Please enter your state of residence: Ohio

Please enter you zip code: 45219

Your name is Jonathan Kenney.

Your age is 18.

You live in the city Cincinnati.

You live in the state Ohio.

Your zip code is 45219.

**Problem 3: I/O statements**

Write a script file that will do the following:

* Prompt the user for the period (T), duty cycle (tau), and number of desired cycles (N) for a square wave using a series of input statements.
* Create and plot a square wave using the user input values for T, tau, and N. The square wave should vary from 0 to 5 volts.
* Add axis labels (x: Time (sec), y: Voltage (V)) and title using xlabel, ylabel, and title (not Plot Tools)
* Uses an fprintf statement to output the frequency (in Hz) of the square wave using 2 places behind the decimal point.
* Uses an fprintf statement to output the average value of the square wave (in V) using 1 place behind the decimal point.

**TEST CASE #1:**

**Run your script and enter the following values: T = 10, tau = 30, N = 3.**

**Paste the resulting output & plot here:**

What is the period? 10

What is the duty cycle? 30

How many cycles? 3

The frequency is 0.10 Hz.

The average Voltage is 1.5 V.



**TEST CASE #2:**

**Run your script and enter the following values: T = 0.2, tau = 60, N = 5.**

**Paste the resulting output & plot here:**

What is the period? .2

What is the duty cycle? 60

How many cycles? 5

The frequency is 5.00 Hz.

The average Voltage is 3.0 V.



**PASTE SCRIPT HERE:**

%Problem 3

clear; clc;

%Inputs

T = input('What is the period? '); %T is the period length

tau = input('What is the duty cycle? '); %tau is the duty cycle

N = input('How many cycles? '); %N = number of cycles

f = 1/T; %f = frequency which = 1/T

Time = 0:0.01:T\*N;

%Analysis

y = 2.5\*square(2\*pi\*f\*Time, tau) + 2.5;

avg\_y = mean(y);

%Output

plot(Time,y,'bo-');

xlabel('\bfTime (sec)','FontSize',14);

ylabel('\bfVoltage (V)','FontSize',14);

title('\bfVoltage vs Time','FontSize',20);

fprintf('The frequency is %0.2f Hz.\n',f);

fprintf('The average Voltage is %0.1f V.\n',avg\_y);

**Problem 4: I/O statements**

In Engineering Foundations, you have been introduced the color code for resistors used to determine to resistor’s nominal value. The color code is summarized in the table:

|  |  |
| --- | --- |
| **Color** | **Value** |
| Black | 0 |
| Brown | 1 |
| Red | 2 |
| Orange | 3 |
| Yellow | 4 |
| Green | 5 |
| Blue | 6 |
| Violet | 7 |
| Gray | 8 |
| White | 9 |

The nominal value for the resistor is determined by reading the three color bands and using the formula:

Nominal Value = (Color1\_Value\*10 + Color2\_Value)\*10Color3\_Value

The 4th band indicates the tolerance and can be used to determine the expected range for the actual resistor value. The table below shows the tolerance color code:

|  |  |
| --- | --- |
| **4th Band Color** | **Tolerance** |
| Gold | 5% |
| Silver | 10% |
| None | 20% |

The actual value of the resistor should be in the range:

Nominal Value \* (1 – Tolerance ) to Nominal Value \* (1 + Tolerance)

with tolerance in decimal rather than %.

Write a script that will do the following:

* Prompt the user for the colors for the 4 color bands using a series of menu statements.
* Compute the nominal value of the resistor using the user input for the first three color bands. *Remember to take into consideration that your color values from your menu statements will range from 1 to 10 but the actual color values range from 0 to 9.*
* Create a 1-d vector (array) with the three tolerance values in decimal (not percent).
* Compute the range for the actual resistor value by using the user input for the 4th band to index into your tolerance array and select the correct tolerance value.
* Use an fprintf statement to display the value of the resistor (in Ohms) using one place behind the decimal point.
* Use an fprintf statement to display the range for the actual resistor value (in Ohms) using one place behind the decimal point.

**TEST CASE #1:**

**Run your script and enter the following colors: YELLOW, VIOLET, RED, NONE**

**Paste the resulting output here:**

The nominal resistor value is 4700.0 Ohms.

The range of values for the resistor is 3760.0 to 5640.0 Ohms.

**TEST CASE #2:**

**Run your script and enter the following colors: GRAY, BROWN, BROWN, GOLD**

**Paste the resulting output here:**

The nominal resistor value is 810.0 Ohms.

The range of values for the resistor is 769.5 to 850.5 Ohms.

**PASTE SCRIPT HERE:**

%Problem 4

clear;

%Input

Color1 = menu('What is the color of the first band? ','Black','Brown','Red','Orange','Yellow','Green','Blue','Violet','Grey','White');

Color2 = menu('What is the color of the second band? ','Black','Brown','Red','Orange','Yellow','Green','Blue','Violet','Grey','White');

Color3 = menu('What is the color of the third band? ','Black','Brown','Red','Orange','Yellow','Green','Blue','Violet','Grey','White');

Color4 = menu('What is the color of the fourth band? ','Gold','Silver','None');

Color1 = Color1 - 1;

Color2 = Color2 - 1;

Color3 = Color3 - 1;

Tolerance\_Options = [.05 .1 .2];

Tolerance = Tolerance\_Options(Color4);

%Analysis

Resistor\_Value = (Color1\*10 + Color2)\*10^Color3;

Resistor\_LowerRange = Resistor\_Value - Resistor\_Value\*Tolerance;

Resistor\_UpperRange = Resistor\_Value + Resistor\_Value\*Tolerance;

%Output

fprintf('The nominal resistor value is %0.1f Ohms.\n',Resistor\_Value);

fprintf('The range of values for the resistor is %0.1f to %0.1f Ohms.\n',Resistor\_LowerRange,Resistor\_UpperRange);

**Turn In:**

**The word (or pdf) document with your plots, MATLAB commands, and answers to questions.**