Lab 8

ENED 1090: MODELS I
Week 8 Laboratory

Submit Week 9 during Lab

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INSTRUCTIONS

Complete each question below by typing your answer or copying from the output in MATLAB or Excel.

This assignment is to be completed outside of class. You will submit a digital copy to your TA during the lab session next week.

!!! **To receive points for this assignment, add your name to the filename. For example, if my name is Lin Yali, I will change the filename to**

Wk08_ened1090_laboratory_LinYali.doc

OBJECTIVES

For this assignment, students will demonstrate

- ▪ The application of input and output statements

For Problems 1-4,: you will apply the instructions to MATLAB (or Octave)
I suggest putting all three into script files, because we will return to them.

PROBLEM 1

Start with the script from Lab7: **HurricaneCategory** complete your script so that it contains

- ✓ A **menu** that asks the user to select the hurricane category based on wind speed.
- ✓ A **fprintf** output that displays the category of the hurricane
- ▫ A **switch construct** that uses the result from the menu and displays the **type of damage** using **fprintf** output commands.

Copy the output from the table below.

CATEGORY	SUSTAINED WIND SPEED (KPH)	TYPES OF DAMAGE
1	119 – 153	**Very dangerous winds will produce some damage:** Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	154 – 177	**Extremely dangerous winds will cause extensive damage:** Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3	178 – 208	**Devastating damage will occur:** Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4	209 – 251	**Catastrophic damage will occur:** Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5	252 – higher	**Catastrophic damage will occur:** A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

Some suggestions:

- • Rename your script – **HurricaneCategory_II**
- • Make sure you have a program header, GPP, and place comments in your code
- • **Make sure you include clear; clc at the beginning of your code**

- Feel free to make the output *pretty*

Have a friend test the code and copy the **output** from the command window here.

```
-----------------------------------Result-----------------------------------
【Category of the hurricane】：                 3
【Type of damage】：              Catastrophic damage will occur.
-------------------------------------------------------------------------------
```

Copy your **script** here.

```matlab
%% HurricaneCategory_II
%  Name: Horace
%  Date: 24 Oct 2018
%  Modified ON : 17 Oct 2018
%  Discription: This script help the users to select the
hurricane category
%               and displays the type of damage.

% Changes: 10/24: Add the display of the type of damage.

%% code
clear;clc;

% Test
speed = menu('Please select the wind speed of the category. ',...
             '119 ¨C 153',...
             '154 ¨C 177',...
             '178 ¨C 208',...
             '209 ¨C 251',...
             '252 ¨C higher');

% Switch the speed and tell the type of damage
switch speed
    case 1
        type = 'Very dangerous winds will produce some damage.';
    case 2
        type = 'Extremely dangerous winds will cause extensive
damage.';
    case 3
        type = 'Devastating damage will occur.';
    case 4
        type = 'Catastrophic damage will occur.';
    case 5
        type = 'Sever catastrophic damage will occur.';
end

% Display
fprintf(['-----------------------------Result------------------
--------\n'...
         '¡¾Category of the hurricane¡¿£º               %i
\n',...
         '¡¾Type of damage¡¿£º'...
         '              %s \n'...
         '----------------------------------------------------
--------\n'],...
          speed,type)
```

PROBLEM 2

Start with the script from Lab7: **ReactorState** complete your script so that it contains

- ✓ A **menu** that asks the user to select the temperature range
- ✓ A **menu** that asks the user to select the pressure range
- ▫ A **if construct** that selects the greater value between the two menus
- ▫ A **switch construct** that uses the result from the **if construct** to output
  - o the state number,
  - o the state description of the reactor,
  - o the input parameter (temperature or pressure) that set the reactor state.
- ✗ (delete) The **fprintf** output that displays the state *number* of the reactor based on temperature
- ✗ (delete) The **fprintf** output that displays the state *number* of the reactor based on pressure

Base your script on the table below.

STATE	TEMPERATURE (°C)	PRESSURE (ATM)
1: Normal	Below 325	Below 0.085
2: Moderate	326 – 335	0.086 – 0.090
3: Severe	336 – 345	0.091 – 0.095
4: Very Severe	346 – 355	0.096 – 0.100
5: Melt Down	356 – higher	0.101 - higher

Some suggestions:

- • Name your script – **ReactorState_II**
- • Make sure you have a program header, GPP, and place comments in your code
- • **Make sure you include clear; clc at the beginning of your code**
- • Feel free to make the output *pretty*

Have a friend test the code and copy the **output** from the command window here.

```
---------------------------Results---------------------------
The 【state number】 is 3.
The 【state description】 :
 【Temperature】
The temperature state is 3.
The description of the temperature is 0.086 - 0.090°C.
 【Pressure】
The pressure state is 2.
The description of the pressure is 0.086 - 0.090ATM.
-------------------------------------------------------------
```

Copy your **script** here.

```matlab
%% ReasctorState_II
%  Name: Horace
%  Date: 24 Oct 2018
%  Modified ON : 17 Oct 2018
%  Discription: This script shows how the state of a Pressurized Water
%               Reactor (PWR) is determined from two inputs

% Changes: 10/24: Delete the fprintf output that displays the state number
%               of the temperature and the pressure.
%               Add the a if construct that selects the greater value
%               between the two menus and a switch construct that uses
%               the result from the if construct to output.

%% code
clear;clc;

% Ask for the temperature state
temperature = menu('Please select the temperature. ',...
                   'Below 325',...
                   '326 ¨C 335',...
                   '336 ¨C 345',...
                   '346 ¨C 355',...
                   '356 ¨C higher');

% Tell the temperature state
switch temperature
    case 1
        descriptionA = 'Below 325';
    case 2
        descriptionA = '326 - 335';
    case 4
        descriptionA = '345 - 355';
    case 5
        descriptionA = '356 - higher';
end

% Ask for the pressuer state
pressure = menu('Please select the pressure. ',...
                   'Below 0.085',...
                   '0.086 ¨C 0.090',...
                   '0.091 ¨C 0.095',...
                   '0.096 ¨C 0.100',...
                   '0.101 - higher');

%Tell the pressuer state
switch pressure
    case 1
        descriptionB = 'Below 0.085';
    case 2
        descriptionB = '0.086 - 0.090';
```

PROBLEM 3

Create a MATLAB script that does the following:
- □ A **randi** command to generate a random integer between 1 and 10,000
- □ A **input** that allows the user to enter an integer between 1 and 10,000
- □ An **if construct** that
  - o decides if the user's number is equal to, bigger than, or smaller than the computer number
  - o displays a reward or penalty for each result.

Some suggestions:
- Name your script – **Rand10000**
- Make sure you have a program header, GPP, and place comments in your code
- **Make sure you include clear; clc at the beginning of your code**
- Feel free to make the output *pretty*

Have a friend test the code and copy the **output** from the command window here.

```
---------winner!!!--------
You win. Congratulations!
A's for everyone!
--------------------------
```

Copy your **script** here.

```matlab
%% Rand10000
% Name£° Horace
% Date: 24 Oct 2018
% Description: a random game

%% Code
clear;clc;

%create the random number
x = randi(10000);

%allow the user to enter an integer between 1 and 10000
y = input('Please enter an integer between 1 and 10000. ');

%compare the result
if x > y
    disp('---------winner!!!--------')
    disp('You win. Congratulations! ')
    disp('A''s for everyone! ')
    disp('-------------------------')
elseif x < y
    dsip('---------Loser~~~--------')
    disp('You lose. Thanks for playing \n')
    disp('C''s for everyone! \n')
    disp('-------------------------')
else
    disp('Try again!');
end
```

PROBLEM 4

Write a script that converts (radians to degrees) and (degrees to radians)
- □ the user enters a number to be converted

□ the user selects from the menu which way to convert
□ the computer calculates and outputs the result

Recall
Radians to degrees: $\theta*180/\pi$
Degrees to radians: $\theta*\pi/180$

Some suggestions:
- Name your script – **AngleConvert**
- Make sure you have a program header, GPP, and place comments in your code
- **Make sure you include clear; clc at the beginning of your code**

Copy your script here.

```
%% AngleConvert
% Name£° Horace
% Date: 24 Oct 2018
% Description: a convert program

%% Code
clear;clc;

% Enter a number to be converted
x = input('Please enter a number to be converted.');

% Select the way to convert
y = menu('Which way to convert?',...
         'Radians to degrees',...
         'Degrees to radians');

% Convert
switch y
    case 1
        z = x*180/pi;
    case 2
        z = x*pi/180;
end

% Output
fprintf('Your angle convert result is %i. \n',z)
```

PROBLEM 5

Write a script that tests the location of a point near a circle:
  i.   inside the circle
  ii.   outside the circle
  iii. on the border of the circle

The code should:
□ ask the user for **x** and **y** coordinates
□ ask the user for the center (**h,k**) and the radius (**r**)
□ compare the data with the following equation for a circle

$$(x - h)^2 + (y - k)^2 = r^2$$

Some suggestions:

- Name your script – **PointAndCircle**
- Make sure you have a program header, GPP, and place comments in your code
- **Make sure you include clear; clc at the beginning of your code**

Have a friend test the code and copy the **output** from the command window here.

```
---------------Result------------
The point is inside the circle.
---------------------------------
```

Copy your **script** here.

```matlab
%% PointAndCircle
%  Name: Horace
%  Date: 24 10 2018
%  Discription: This script tests the location of a point near a
circle

%% Code
clear;clc;

% Ask for x and y coordinates
x = input('What is the value of x?');
y = input('What is the value of y?');

% Ask for the center (h,k) and the radius (r)?
h = input('What is the value of h?');
k = input('What is the value of k?');
r = input('What is the radius?');

% Compare the data
A = (x-h)^2+(y-k)^2;
if A > (r^2)
    fprintf(['--------------Result----------- \n',...
             'The point is outside the circle. \n'...
             '--------------------------------\n'])
elseif A < (r^2)
    fprintf(['--------------Result----------- \n',...
             'The point is inside the circle. \n'...
             '--------------------------------\n'])
elseif A == (r^2)
    fprintf(['--------------Result--------------- \n',...
             'The point is on the border of the circle. \n'...
             '-----------------------------------\n'])
end
```

For Problems 6: you will apply the instructions to the worksheet in
Wk08_ened1090_homework_xls

PROBLEM 6

For this problem, you will be looking at a sample grade sheet for 10 students The data is compiled in the *Wk08_ened1090_homework_xls* file. On the worksheet, write formulas that will calculate the total GPA for each student.

The weighted GPA is calculated from

$$GPA = \frac{\sum(ch \cdot gpa)}{\sum(ch)}$$

where ch = credit hours of each course, gpa = grade point average of each course, and GPA = total GPA.

Hint: an example is provided for the CALCULUS letter grade of Student 1, and the students total GPA.

Insert an **image** of the completed table here

Student	CALCULUS			PHYSICS			PHYSICS LAB			ENGLISH			ENGINEERING MODELS I			Total GPA
	Credit Hours:		4	Credit Hours:		3	Credit Hours:		1	Credit Hours:		3	Credit Hours:		2	
	Score	Letter Grade	GPA	Score	Letter Gr	GPA	Score	Letter Gr	GPA	Score	Letter Gr	GPA	Score	Letter Gr	GPA	
1	94	A	4	69	D+	1.3	96	A	4	96	A	4	65	D	1	2.92
2	74	C	2	74	C	2	77	C+	2.3	86	B	3	83	B	3	2.41
3	90	A-	3.7	73	C	2	50	F	0	100	A	4	66	D	1	2.68
4	78	C+	2.3	62	D-	0.7	53	F	0	69	D+	1.3	86	B	3	1.63
5	77	C+	2.3	93	A	4	86	B	3	91	A-	3.7	97	A	4	3.33
6	77	C+	2.3	70	C-	1.7	57	F	0	72	C-	1.7	65	D	1	1.65
7	96	A	4	97	A	4	93	A	4	53	F	0	73	C	2	2.77
8	89	B+	3.33	64	D	1	85	B	3	79	C+	2.3	60	D-	0.7	2.12
9	65	D	1	93	A	4	96	A	4	95	A	4	98	A	4	3.08
10	91	A-	3.7	93	A	4	79	C+	2.3	75	C	2	55	F	0	2.70

Insert an **image** of the table with the option *Show Formulas* selected