# Lab 7

**ENED 1090: MODELS I**
Week 7 Laboratory

Submit Week 8 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**

**Wk07_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

Write a script that contains:

- Four **input** statements that ask the user for
    - o 'What is your favorite candy bar?'
    - o 'What is your favorite integer?'
    - o 'What is your favorite restaurant?'
    - o 'Who is your favorite music artist?'
- Two **fprintf** statements
    - o Statement #1: Display the user's favorite artist and favorite integer.
    - o Statement #2: Display the user's favorite restaurant and favorite food.

Some suggestions:

- Name your script – **ModelsQuestionaire**
- Make sure you have a program header, GPP, and place comments in your code
- Feel free to make the output *pretty*

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

```
-----------Statement #1:-----------
The user's favorite artist is C.
The user's favorite integer is 1.
------------------------------------
------------Statement #2:------------
The user's favorite restaurant is B.
The user's favorite food is A.
----------------------------------------
>>
```

Copy your **script** here.

```matlab
%% ModelsQuestionaire
%  Name: Horace
%  Date: 16 Oct 2018
%  Discription: This script make some questions for the users

%% Code
clear;clc;

% Ask for the favorite food of the user
food = input('What is your favorite candy bar? ','s');

% Ask for the favorite integer of the user
integer = input('What is your favorite integer? ');

% Ask for the favorite restaurant of the user
restaurant = input('What is your favorite restaurant? ','s');

% Ask for the favorite artist of the user
artist = input('Who is your favorite music artist? ','s');

% Display
fprintf(['----------Statement #1:-----------\n'...
         'The user''s favorite artist is %s.\n'...
         'The user''s favorite integer is %i.\n'...
         '---------------------------------\n'],...
          artist,integer);

fprintf(['------------Statement #2:-------------\n'...
         'The user''s favorite restaurant is %s.\n'...
         'The user''s favorite food is %s.\n'...
         '-------------------------------------\n'],...
          restaurant,food);
```

**PROBLEM 2**

The following table is based on the Saffir-Simpson Hurricane Wind Scale

| 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.

Write a script that 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

Some suggestions:
- Name your script – **HurricaneCategory**
- Make sure you have a program header, GPP, and place comments in your code
- Feel free to make the output *pretty*

Copy your **script** here.

```matlab
%% HurricaneCategory
%  Name: Horace
%  Date: 17 Oct 2018
%  Discription: This script help the users to select the
hurricane category

%% 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');

% Display
fprintf(['----------------------Result--------------------
\n'...
         'The category of the hurricane the user choose is %i.
\n',...
         '1:Very dangerous\n'...
         '2:Extremely dangerous\n'...
         '3:Devastating\n'...
         '4:Catastrophic\n'...
         '------------------------------------------------
\n'],...
          speed)
```

Next week we will discuss how to use a *logical switches* to return specific information based on the menu selection. Describe what is happening in flowchart.
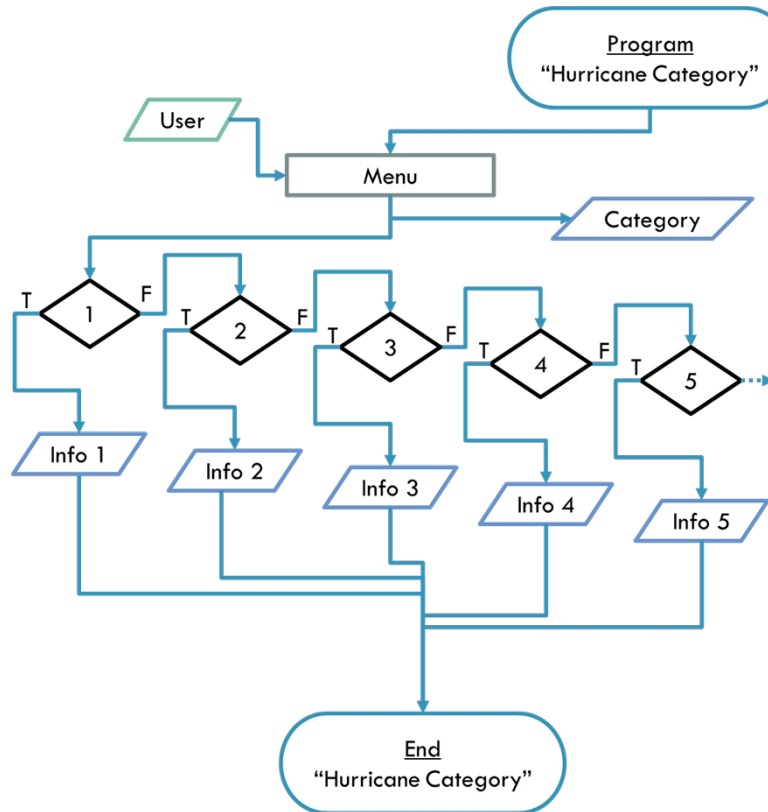
To do a research on the user, we make a program called "Hurricane Category".
Firstly, the user run the program, entering a menu, which will give you a choice whether your choice is category 1.
Secondly, the user will decide category 1 is true or false.
Finally, if the user chooses the option true, the program will give the information of this wind speed level the end automatically;
    if the user chooses the option false, the program will give another two options in order to make you decide whether it is category 2.
The program will keep running until category 5 decision.

## PROBLEM 3

The table below shows how the state of a Pressurized Water Reactor (PWR) is determined from two inputs. If the two inputs don't result in the same state, the higher state should be chosen. For example, a reactor with a temperature and pressure of 350 °C and 0.092 atm, would be categorized as *'very severe'* for the temperature reading and *'severe'* for the pressure reading. The resulting state should be *'very severe'* for the reactor.

| 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 |

Write a script that contains
  □ A **menu** that asks the user to select the temperature range.
  □ A **menu** that asks the user to select the pressure range.
  □ A **fprintf** output that displays the state *number* of the reactor based on temperature
  □ A **fprintf** output that displays the state *number* of the reactor based on pressure
Some suggestions:
  • Name your script – **ReactorState**
  • Make sure you have a program header, GPP, and place comments in your code
  • Feel free to make the output *pretty*
  • To save time, consider starting with a copy of **HurricaneCategory** and making the necessary changes

Copy your **script** here.

```matlab
%% ReactorState
%   Name: Horace
%   Date: 17 Oct 2018
%   Discription: This script shows the temperature state and
pressure state

%% code
clear;clc;

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

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

% Display
fprintf(['----------------------Temperature State------------
-----------\n'...
        'The state number of the user''s reactor based on
temperature is %i. \n'...
        '1:Normal\n'...
        '2:Moderate\n'...
        '3:Severe\n'...
        '4:Very Severe\n'...
        '5:Melt Down\n'...
        '-------------------------------------------------------
-----------\n'],...
        temperature);

fprintf(['-------------------------Pressure State-------------
-----------\n'...
        'The state number of the user''s reactor based on
pressure is %i. \n'...
        '1:Normal\n'...
        '2:Moderate\n'...
        '3:Severe\n'...
        '4:Very Severe\n'...
        '5:Melt Down\n'...
        '-------------------------------------------------------
-----------\n'],...
        pressure)
```

Next week we will discuss how to use a *logical switches* to return the condition based on the problem condition (the more *severe* option between temperature and pressure) Construct a that describes how this can be done. (*Hint: start recreate the flow chart of the previous problem and make the necessary changes.*)

Use **powerpoint** (or draw.io) to construct the flowchart and copy an image below.
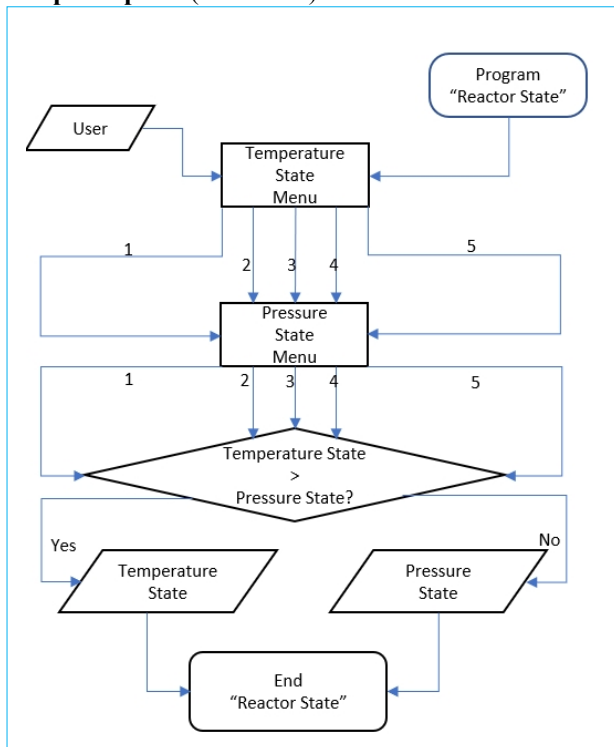


## PROBLEM 4

The diagram below shows the direction that two objects will move depending on the sign of the velocity: a positive $V_1$ (for object 1) is moving to the right while a positive $V_2$ (for object 2) is moving to the left.
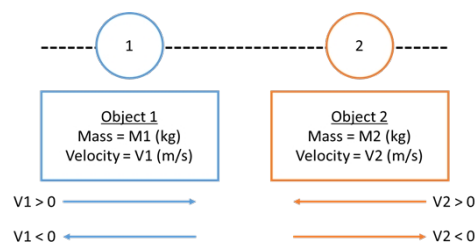


Write a script that contains
- Four **input** statements to prompt the user for the *mass* and the *velocity* of each object
- An **input** statement that asks the user for a collision type (choices below)
  - inelastic
  - elastic
- Use a single **fprintf** output that displays all the entered information

Some suggestions:
- Name your script – **ObjectCollision**
- Make sure you have a program header, GPP, and place comments in your code
- Feel free to make the output *pretty*

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

```
-------Information for the collision------
Object1: The mass is 1, the velocity is 2.
Object2: The mass is 3, the velocity is 4.
This is a elastic collision.
---------------------------------------------
```

Copy your **script** here.

```matlab
%% ReactorState
%  Name: Horace
%  Date: 17 Oct 2018
%  Discription: This script shows the specific data of a
collision between two objects

%% Code
clear;clc;

% Data dictionary
%M1          %The mass of object1[kg]
%V1          %The velocity of object1[m/s]
%M2          %The mass of object2[kg]
%V2          %The velocity of object2[m/s]
%type        %The collision type

% Ask for the mass of object1
M1 = input('What is the mass of object1? ');

% Ask for the velocity of object1
V1 = input('What is the velocity of object1? ');

% Ask for the mass of object2
M2 = input('What is the mass of object2? ');

% Ask for the velocity of object2
V2 = input('What is the velocity of object2? ');

% Ask for the collision type
type = input('Is the collision type inelastic or elastic? ','s');

% Display the information
fprintf(['-------Information for the collision-------\n',...
        'Object1: The mass is %i, the velocity is %i.\n'...
        'Object2: The mass is %i, the velocity is %i.\n'...
        'This is a %s collision.\n'...
        '------------------------------------------\n'],...
        M1,V1,M2,V2,type)
```

*For Problems 5: you will apply the instructions to the worksheet in*
*Wk07_ened1090_homework_xls*

**PROBLEM 5**

For this problem, you will be looking at data for the value (in USD) of goods imported and exported for countries around the world in 2016. This information is found in the ***Wk07_ened1090_homework_xls*** file. On the worksheet, write formulas that will do the following:

Calculate
- the average (mean) value of all imports and exports
- the median value of all imports and exports
- the maximum value of all imports and exports

- ▫ the minimum value of all imports and exports
- ▫ the mode value of all imports and exports
- ▫ the range of values of all imports and exports

*Hint: an example is provided that contains Excel's Statistics functions needed to complete this exercise.*
*Statistics functions:      =AVERAGE(),     =MEDIAN(),      =MAX(),           =MIN(),           =MODE()*

Insert an **Image** of the completed table here.

| | EXPORTS | IMPORTS |
|---|---|---|
| AVERAGE | $      120,014,681,151.05 | $      64,075,241,456.94 |
| MEDIAN | $      13,233,742,795.50 | $      6,323,849,619.50 |
| MAXIMUM | $  2,097,637,171,895.00 | $  833,166,060,724.00 |
| MINIMUM | $      6,539,681.00 | $      99,617,528.00 |
| MODE | #N/A | #N/A |
| RANGE | $  2,097,630,632,214.00 | $  833,066,443,196.00 |

| | EXPORTS | IMPORTS |
|---|---|---|
| AVERAGE | =AVERAGE(C2:C123) | =AVERAGE(D2:D123) |
| MEDIAN | =MEDIAN(C2:C123) | =MEDIAN(D2:D123) |
| MAXIMUM | =MAX(C2:C123) | =MAX(D2:D123) |
| MINIMUM | =MIN(C2:C123) | =MIN(D2:D123) |
| MODE | =MODE(C2:C123) | =MODE(D2:D123) |
| RANGE | =H7-H8 | =I7-I8 |