**Lab 5: Conditional Statements**

**Problem 1:** Create a script file that will prompt the user for a mass in kg (use an ***input statement***), followed by a ***menu statement*** which asks the user if they would like to convert the mass to *‘lbm’* (for pounds mass) or *‘slugs’* (for slugs). Write a ***switch*** statement with two cases (**switch menu\_variable case 1 … case 2 … end** ) to convert the mass to the chosen units. If you do not remember the unit conversion formulas, you can look them up. Add ***fprintf statements*** to your cases to display the mass in the selected units with three places behind the decimal point. Be sure to include the units in your fprintf statements. Test your code using the following inputs and see if you get the correct mass in slugs.

*Enter the mass in kilograms (kg): 10*

*Do you want to convert to ‘lbm’ or ‘slugs?: slugs*

*The mass is 0.685 slugs.*

**Paste a sample output when ‘lbm’ is selected and 20 kgs is the mass input:**

Enter the mass in kg: 20

The mass is 44.092 lbm.

**Paste a sample output when ‘slugs’ is selected and 20 kgs is the mass input:**

Enter the mass in kg: 20

The mass is 1.370 slugs.

**Paste your script below**

%Problem 1

clear;

%Input

mass\_kg = input('Enter the mass in kg: ');

mass\_conversion = menu('Would you like to convert to lbm or slugs?','lbm','slugs');

%Analysis (and output)

switch mass\_conversion

case 1

mass\_converted = mass\_kg\*2.2046226;

fprintf('The mass is %0.3f lbm.\n',mass\_converted);

case 2

mass\_converted = mass\_kg\*0.0685218;

fprintf('The mass is %0.3f slugs.\n',mass\_converted);

end

**Problem 2** The pH of an aqueous solution is a measure of its acidity. The pH scale ranges from 0 to 14, inclusive. A solution with a pH of 7 is neutral, a solution with a pH less than 7 is acidic and a solution with a pH greater than 7 is basic. Create a script file that will prompt the user to input the pH of a solution. First check to see if the pH is invalid (outside the range of 0 to 14, inclusive). If it is, generate an error message. An error message can be created with the following line of code: error(‘Your pH is not in the proper range’). Next, add an **if … elseif … else** conditional statement to determine if the solution is acidic, basic, or neutral. Add *fprintf statement(s)* to display to the user whether the solution is acidic, neutral, or basic.

**Test your code using by creating 4 test cases to cover the four possible outputs (acidic, basic, neutral, and out of range). Paste the resulting outputs in the space below.**

**Sample Outputs:**

Enter your pH value: 6

Your pH is acidic**.**

Enter your pH value: 7

Your pH is neutral.

Enter your pH value: 8

Your pH is basic.

Enter your pH value: 15

Error using Models\_Lab5 (line 26)

Your pH is not in the proper range.

**Paste your Script file here:**

%Problem 2

clear;

pH\_value = input('Enter your pH value: '); %Input

if pH\_value < 0 || pH\_value > 14

error('Your pH is not in the proper range.');

elseif pH\_value < 7

fprintf('Your pH is acidic.\n');

elseif pH\_value == 7

fprintf('Your pH is neutral.\n');

elseif pH\_value > 7

fprintf('Your pH is basic.\n')

end

**Problem 3:** Write a MATLAB Script File that will determine the condition of a Pressurized Water Reactor (PWR) for generating electrical power from nuclear energy. For this design, the water in the reactor core reaches about 325°C and it must be kept 150 times under the atmospheric pressure to prevent it from boiling. You have been given the task of developing a monitoring system for the nuclear reactor. The system will require a user to ***input*** the temperature and pressure values read from gages. Temperature will be read in Celsius and pressure will be read in atm’s. The program will determine the state of the nuclear reactor (conditional statement) using the table on the next page, and then output using *fprintf* the following statement: ***The Nuclear Reactor is categorized as*** followed by the correct Category. Add additional *fprintf statements* to output what was inputted for the temperature and pressure. Be sure to include units in your statements. The table below lists the conditions based on the temperature and pressure readings.

|  |  |  |
| --- | --- | --- |
| **Category** | **Temperature (°C)** | **Pressure**  **(atm)** |
| Melt Down | Temp > 355 | Press > 0.100 |
| Very Severe | 345 < Temp ≤ 355 | 0.095 < Press ≤ 0.100 |
| Severe | 335 < Temp ≤ 345 | 0.090 < Press ≤ 0.095 |
| Moderate | 325 < Temp ≤ 335 | 0.085 < Press ≤ 0.090 |
| Normal | Temp ≤ 325 | Press ≤ 0.085 |

**Other Requirements for the Program**: If the readings put the condition in two different categories, the higher category should be selected. For example, a reactor with a temperature & pressure reading of 350 °C & 0.092 atm., respectively, would be categorized as “very severe” for the temperature reading and “severe” for the pressure reading. The program should output “very severe” for the reactor condition.

**Fill out the following Table using your code to identify the condition. You should use this table to help check if your logic is correct.**

|  |  |  |
| --- | --- | --- |
| **Temperature** | **Pressure** | **Condition** |
| **375** | **0.097** | Melt Down |
| **350** | **0.102** | Melt Down |
| **340** | **0.097** | Very Severe |
| **340** | **0.087** | Severe |
| **320** | **0.087** | Moderate |
| **310** | **0.080** | Normal |

**Paste sample output from your code for Temperature = 375 °C and Pressure = 0.097 atm.:**

Enter the temperature (degC): 375

Enter the pressure (atm): .097

The Nuclear Reactor is catagorized as Melt Down.

**Paste your script here:**

%Problem 3

clear;

%Input

Temperature = input('Enter the temperature (degC): ');

Pressure = input('Enter the pressure (atm): ');

if Temperature > 355 || Pressure > 0.100

fprintf('The Nuclear Reactor is catagorized as Melt Down.\n');

elseif Temperature > 345 || Pressure > .095

fprintf('The Nuclear Reactor is catagorized as Very Severe.\n');

elseif Temperature > 335 || Pressure > .09

fprintf('The Nuclear Reactor is catagorized as Severe.\n');

elseif Temperature > 325 || Pressure > .085

fprintf('The Nuclear Reactor is catagorized as Moderate.\n');

elseif Temperature <= 325 || Pressure <= .085

fprintf('The Nuclear Reactor is catagorized as Normal.\n');

end

**Turn in Next Week:**

This document with answers, sample output, and your code.