**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:**

**What is the mass? 20**

**44.092**

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

**What is the mass? 20**

**1.370**

**Paste your script below**

clear;clc

mass\_kg = input('What is the mass? ');

c = menu('Convert mass to pounds or slugs? ', 'Lbs', 'slugs');

switch c

case 1

conversion = mass\_kg\*2.20462;

unit = 'pounds';

case 2

conversion = mass\_kg\*0.0685;

unit = 'slugs';

end

fprintf('Your mass in lbs is %0.3f %s!\n', conversion, unit);

**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:**

**What is the pH of the solution? 3**

**You solution is acidic**

**What is the pH of the solution? 7**

**Your solution is neutral**

**What is the pH of the solution? 9**

**Your solution is basic**

**What is the pH of the solution? 67**

**Error using Lab\_5\_script (line 6)**

**Your pH is not in the proper range.**

**Paste your Script file here:**

clear;clc

pH = input('What is the pH of the solution? ');

if pH >14 || pH<0 ;

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

elseif pH >= 0 && pH <7 ;

concentration = 'acidic';

elseif pH >7 ;

concentration = 'basic';

else

concentration = 'neutral';

end

fprintf('Your solution is %s\n', concentration);

**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** | Meltdown |
| **350** | **0.102** | Meltdown |
| **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.:**

What is the temperature(C°) of the reactor? 375

What is the pressure(atm) of the reactor? 0.097

The reactor condition is: MELTDOWN

**Paste your script here:**

clear;clc

temperature = input('What is the temperature(C°) of the reactor? ');

pressure = input('What is the pressure(atm) of the reactor? ');

if temperature>355 || pressure>0.100;

reactor = 'MELTDOWN';

elseif temperature > 345 || pressure > 0.095;

reactor = 'VERY SEVERE';

elseif temperature > 335 || pressure > 0.090;

reactor = 'SEVERE';

elseif temperature > 325 || pressure > 0.085;

reactor = 'MODERATE';

else

reactor = 'NORMAL';

end

fprintf('The reactor condition is: %s\n', reactor);

**Turn in Next Week:**

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