**Student Name: Weight: 20%**

**Student ID:** **Marks:** **/100**

# Assignment: Programming Basics

## Scenario

Global Green Energy (GGE) is a utility company that specializes in providing Canadian customers with more environmentally friendly utility options. The company was the first to distribute natural gas blended with green hydrogen to residential Canadian markets. GGE has hired your company to create a tool for their customer website that will calculate a customer’s total monthly utility bill.

## Equipment and Materials

For this assignment, you will need:

* Python IDE

## Instructions

This assignment consists of three sections, all completed outside of class time. See the course schedule and Brightspace for exact dates.

**Individual Submission (20%)**

1. Working individually, review the Scenario and the Utility Bill Details sections of this document.
2. Draft a flowchart to represent the process of calculating a customer’s monthly utility bill.
3. Write a program that meets the requirements described in the scenario above, creating a tool that will calculate a customer’s total monthly utility bill in **CDN$**.

Your program should ask the user to enter the following information:

* Account number
* Month
* Type of electricity plan (EFIR or EFLR)
* Amount of electricity used (in kWh)
* Type of natural gas plan (GFIR or GFLR)
* Amount of natural gas used (in GJ)
* Province

1. When your program is complete, use the data listed in each of the three tests below to see if your program works correctly.

**Note:** Check your program against the marking criteria for individual submissions. Keep in mind that you will be refining the program later as a group.

1. Submit the following to Brightspace:

* A copy of your draft flowchart (your instructor may indicate a preferred format)
* The code of the program that you implemented (.py file)
* A copy of the output from your three test runs (.txt file)

**Group Submission (75%)**

1. After you’ve submitted your individual solution, join a group as directed by your instructor.
2. Share your program and your draft flowchart with your group and work together to develop one common solution.
3. Check your group solution against the detailed marking criteria at the end of this document.
4. Submit this final version of the code as a group. Only one copy is required per group, and any of the group members may submit the following to Brightspace:

* A copy of the flowchart (your instructor may indicate a preferred format)
* The code of the program that you implemented (.py file)
* A copy of the output from your three test runs (.txt file)

**Peer Assessment (5%)**

Each student must also complete a peer assessment of their group members. Your instructor will provide further submission details.

## Utility Bill Details

* Every GGE customer pays a fixed monthly fee of $120.62.
* In addition to the monthly fee, customers are charged according to their actual consumption and the type of plan in which they’re enrolled. To keep administration costs down, GGE requires that customers receive both electricity and natural gas through GGE.

**Note:** Electricity and gas prices are in cents. To convert to Canadian dollars (CDN$), multiply by 0.01.

* For electricity, customers choose one of these two options:
  + **Fixed rate (EFIR):** the price of one kWh is 8.36 ¢/kWh for the first 1000 kWh, guaranteed for 4 years. After the first 1000 kWh, the price of one kWh is 9.41 ¢/kWh
  + **Floating rate (EFLR):** the rate fluctuates monthly based on the market conditions and weather. This rate is determined at the end of each month and applies only to that month’s consumption. This month, the price is 9.11 ¢/kWh.
* For natural gas, customers choose one of these two options:
  + **Fixed rate (GFIR):** the price of one GJ is 4.56 ¢/GJ for the first 950 GJ, which is guaranteed for 4 years. After 950 GJ, the price of one GJ is 5.89 ¢/GJ
  + **Floating rate (GFLR):** the rate fluctuates monthly based on the market conditions and weather. This rate is determined at the end of each month and applicable only to that month’s consumption. This month, the price is 3.93 ¢/GJ
* Every natural gas customer is charged a fixed monthly transaction fee of $1.32 to help cover the cost of GGE’s industry-leading blended natural gas supply network.
* The company is required to apply a specific sales tax rate depending on the province that the customer lives in (see table below).

|  |  |
| --- | --- |
| **Province** | **Tax rate** |
| Alberta (AB), British Columbia (BC), Manitoba (MB), Northwest Territories (NT), Nunavut (NU), Quebec (QC), Saskatchewan (SK) and Yukon (YT) | 5% |
| Ontario (ON) | 13% |
| New Brunswick (NB), Newfoundland and Labrador (NL), Nova Scotia (NS) and Prince Edward Island (PE) | 15% |

## Bill Calculator Tests

#### Input values are shown in bold underline.

#### Test 1

Welcome to Global Energy bill calculator!

Enter the account number: **123456**

Enter the month number, i.e. for January, enter 1: **2**

Enter the Electricity plan (EFIR or EFLR): **EFIR**

Enter amount of Electricity used in month 2 (in kWh): **500**

Enter the gas plan (GFIR or GFLR): **GFIR**

Enter amount of gas used in month 2 (in GJ): **700**

Enter the province abbreviation (2 letters): **AB**

#### Thank you!

#### Total Amount Due Now: $205.44

#### Test 2

Welcome to Global Energy bill calculator!

Enter the account number: **456789**

Enter the month number, i.e. for January, enter 1: **4**

Enter the Electricity plan (EFIR or EFLR): **EFLR**

Enter amount of Electricity used in month 4 (in kWh): **700**

Enter the gas plan (GFIR or GFLR): **GFLR**

Enter amount of gas used in month 4 (in GJ): **650**

Enter the province abbreviation (2 letters): **BC**

Thank you!

Total Amount Due Now: $221.82

**Test 3**

Welcome to Global Energy bill calculator!

Enter the account number: **147852**

Enter the month number, i.e. for January, enter 1: **11**

Enter the Electricity plan (EFIR or EFLR): **EFIR**

Enter amount of Electricity used in month 11 (in kWh): **1100**

Enter the gas plan (GFIR or GFLR): **GFLR**

Enter amount of gas used in month 11 (in GJ): **1320**

Enter the province abbreviation (2 letters): **NT**

Thank you!

Total Amount Due Now: $280.17

## Marking Criteria

### Individual Submission

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Needs Improvement (0–49%)** | **Passing (50–100%)** | **Marks** |
| **Individual work** | * Program meets less than half of the requirements required for the group submission * Incorrect file(s) submitted * Flow chart not submitted | * Program works in most scenarios, but could use improvement * Most inputs can be entered as required, and most outputs are generated as required * Reasonable effort has been made to format the output as required * Flow chart submitted | **/20** |
| **Peer assessment** | * Not submitted or incomplete | * Completed for all group members | **/5** |

### Group Submission

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Needs Improvement (0–50%)** | **Good (51–75%)** | **Excellent (76–100%)** | **Marks** |
| **Flow chart** | * Largely incomplete * Poor structure | * Good overall design, but not complete or there are steps missing | * Excellent design which can be followed to write a functional code * No missing steps or branches | **/10** |
| **Working code** | * The project doesn’t run in all scenarios * Input requests work but don’t match the scenario * No conversion of data types * Syntax of if/else statements has mistakes * Output works but doesn’t match the scenario | * The project runs in all scenarios * Input requests work but don’t match the scenario * Some data types are not ideal * Correct use of if/else statements * Output works but doesn’t match the scenario | * The project runs in all scenarios * Input requests match the scenario exactly * Correct data types used * Correct use of if/else statements * Output matches the scenario | **/45** |
| **Style** | * Indentation – not consistent * Readability – poor variable names * Documentation * No comments are included at the top. * No comments indicating major code sections or what they do | * Indentation – some parts are consistent and some are not * Readability – some variable names are not ideal * Documentation * Comments at the top are missing or incomplete. * Comments indicating major code sections and what they do are incomplete | * Indentation – consistent * Readability – good variable names * Documentation * Comments at the top are complete and include name, date, program description including details on inputs, processing and outputs  (4–5 sentences minimum). * Comments indicate major code sections and what they do | **/10** |
| **Testing** | * Sample output doesn’t match the provided test plan * Output is not formatted according to the specification (test plan) | * Parts of the sample output don’t exactly match the provided test plan * Output formatted according to the specification (test plan) | * Sample output exactly matches the provided test plan * Output formatted according to the specification (test plan) | **/10** |
| **Total** | | | | **/100** |