

INDIVIDUAL ASSIGNMENT

Deadlines: 7 June 2021

Reminder:

This is an individual assignment and please do it yourself. Please do not copy your friend's report. If caught both parties will be given 0 mark. Use all the knowledge that you have learned (i.e., Black-box and White-box testing techniques) in order to complete the assignment.

Introduction

The aim of the assignment is to assess your understanding on the basic concepts and techniques of software testing. You are going to test a simple system based on both black-box and white-box testing techniques. You are given a Java code (i.e. ElectricityBil.java), the requirements and the design as the test basis. The function of the Java code is to calculate electricity bill based on the electricity consumption, type of user and type of sector.

You are required to test the functionality of the code based on the following requirements:

1. The system shall calculate the estimated bill for residential type of user.
2. The system shall calculate the estimated bill for commercial type of user under Tariff B.

What you have to do:

1. Analyze the given test basis.
2. Design test cases based on the techniques that you have learned.
3. Prepare a test script.
4. Execute the tests using a tool.
5. Assess the quality of the test cases that you have design.
6. Prepare a report that consists of:
 - a. Test strategy (i.e. based on your analysis, how are you going to conduct the test)
 - b. Test design
 - c. Test Script (i.e. a list of test cases that you have identified from test design)
 - d. Test class that consists of test methods (i.e. in the format of JUnit test class)
 - e. Coverage information (i.e. print screen code under test and the percentage coverage. This can be obtained after you execute you JUnit coverage)
 - f. Concluding remarks,
 - i. Justify why your solution (i.e. in terms of strategy and techniques) is the most effective in testing the given system.
 - ii. Justify the readiness of the system for deployment?

Test Basis:

1. System's requirements
2. System's design
3. Source code, ElectricityBill.java (see **Appendix A**)

System Requirements

The Electricity Tariff:

The system displays the estimated price based on the following information:

TARIFF CATEGORY		UNIT	CURRENT RATE (1 JAN 2018)
Tariff A - Domestic Tariff			
1.	For the first 200 kWh (1 - 200 kWh) per month	sen/kWh	21.80
	For the next 100 kWh (201 - 300 kWh) per month	sen/kWh	33.40
	For the next 300 kWh (301 - 600 kWh) per month	sen/kWh	51.60
	For the next 300 kWh (601 - 900 kWh) per month	sen/kWh	54.60
	For the next kWh (901 kWh onwards) per month	sen/kWh	57.10
	The minimum monthly charge is RM3.00		

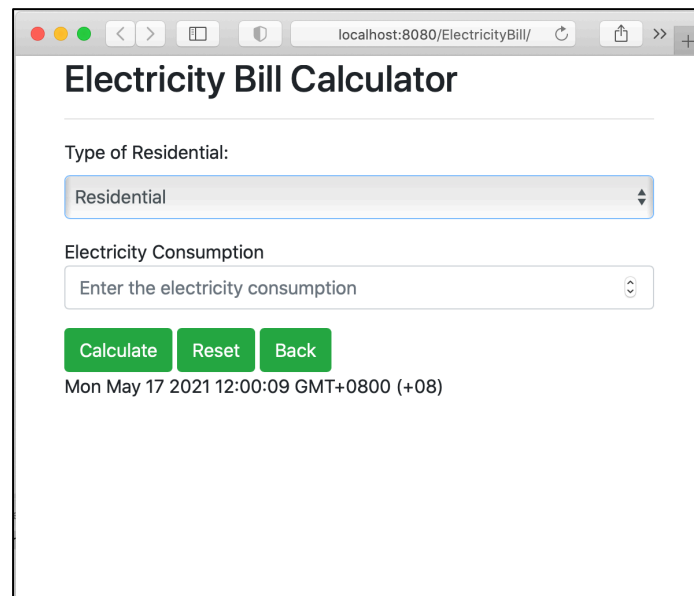
Figure 1: Tariff for Residential User

TARIFF CATEGORY	CURRENT RATES(1 JAN 2014)
TARIFF B - LOW VOLTAGE COMMERCIAL TARIFF	
For the first 200 kWh (1 -200 kWh) per month	43.5 sen/kWh
For the next kWh (201 kWh onwards) per month	50.9 sen/kWh

Figure 2: Tarif for Non-Residential

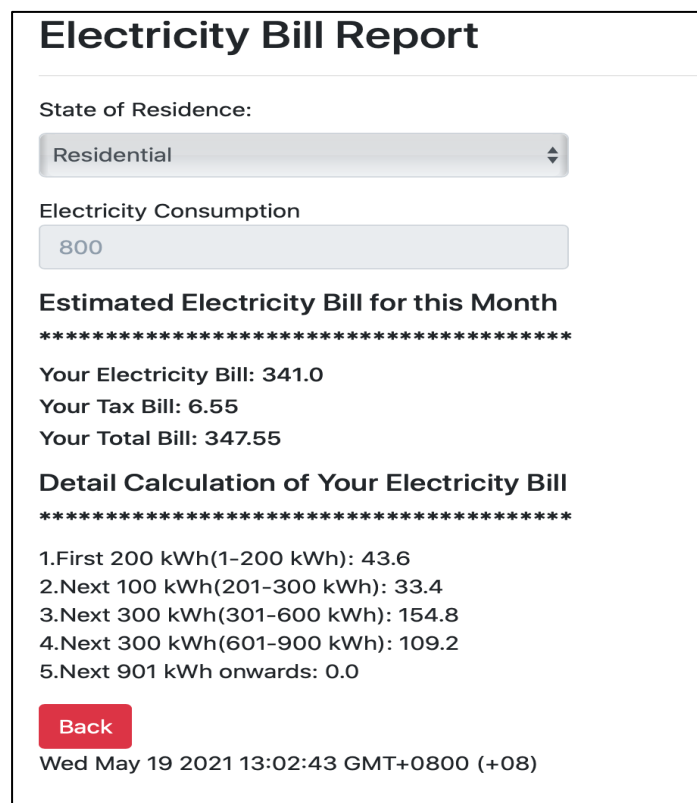
The system's interface are as follows:

1. Type of Residential consists of Residential or Non-Residential. If the user enters Residential, the system shall calculate the estimated bill based on electricity consumption entered by the user and tariff as specified Figure 1.



The screenshot shows a web browser window with the address bar displaying 'localhost:8080/ElectricityBill/'. The page title is 'Electricity Bill Calculator'. Below the title, there is a label 'Type of Residential:' followed by a dropdown menu with 'Residential' selected. Below this is a label 'Electricity Consumption' followed by a text input field containing 'Enter the electricity consumption'. At the bottom of the form are three green buttons: 'Calculate', 'Reset', and 'Back'. Below the buttons, the timestamp 'Mon May 17 2021 12:00:09 GMT+0800 (+08)' is displayed.

Figure 4: The input for Residential



The screenshot shows a web browser window displaying the 'Electricity Bill Report'. The page title is 'Electricity Bill Report'. Below the title, there is a label 'State of Residence:' followed by a dropdown menu with 'Residential' selected. Below this is a label 'Electricity Consumption' followed by a text input field containing '800'. The main content area is titled 'Estimated Electricity Bill for this Month' and is separated from the rest of the page by a line of asterisks. Below this title, the following information is displayed: 'Your Electricity Bill: 341.0', 'Your Tax Bill: 6.55', and 'Your Total Bill: 347.55'. Below this is another title 'Detail Calculation of Your Electricity Bill' followed by a line of asterisks. Below this title, the following information is displayed: '1.First 200 kWh(1-200 kWh): 43.6', '2.Next 100 kWh(201-300 kWh): 33.4', '3.Next 300 kWh(301-600 kWh): 154.8', '4.Next 300 kWh(601-900 kWh): 109.2', and '5.Next 901 kWh onwards: 0.0'. At the bottom of the report is a red button labeled 'Back'. Below the button, the timestamp 'Wed May 19 2021 13:02:43 GMT+0800 (+08)' is displayed.

Figure 5: The sample output for Residential

2. On the other hand, if the user select Non-Residential for the type of residential, the system will ask for the value of type of sector. The value can be either Commercial or Industrial. Next, the system will ask for tariff code. Then, the system shall calculate the amount of electricity bill based on the selected tariff code as specified in Figure 2.

The screenshot shows a web browser window with the URL `localhost:8080/ElectricityBill/`. The page title is "Electricity Bill Calculator". The form contains the following fields and controls:

- Type of Residential:** A dropdown menu with "Non-Residential" selected.
- Type of Sector:** A dropdown menu with "Commercial" selected.
- Tariff Code:** A dropdown menu with "Tariff B: Low Voltage Commercial" selected.
- Electricity Consumption:** A text input field with the placeholder "Enter the electricity consumption".
- Buttons:** Three green buttons labeled "Calculate", "Reset", and "Back".
- Footer:** The text "Mon May 17 2021 11:42:21 GMT+0800 (+08)".

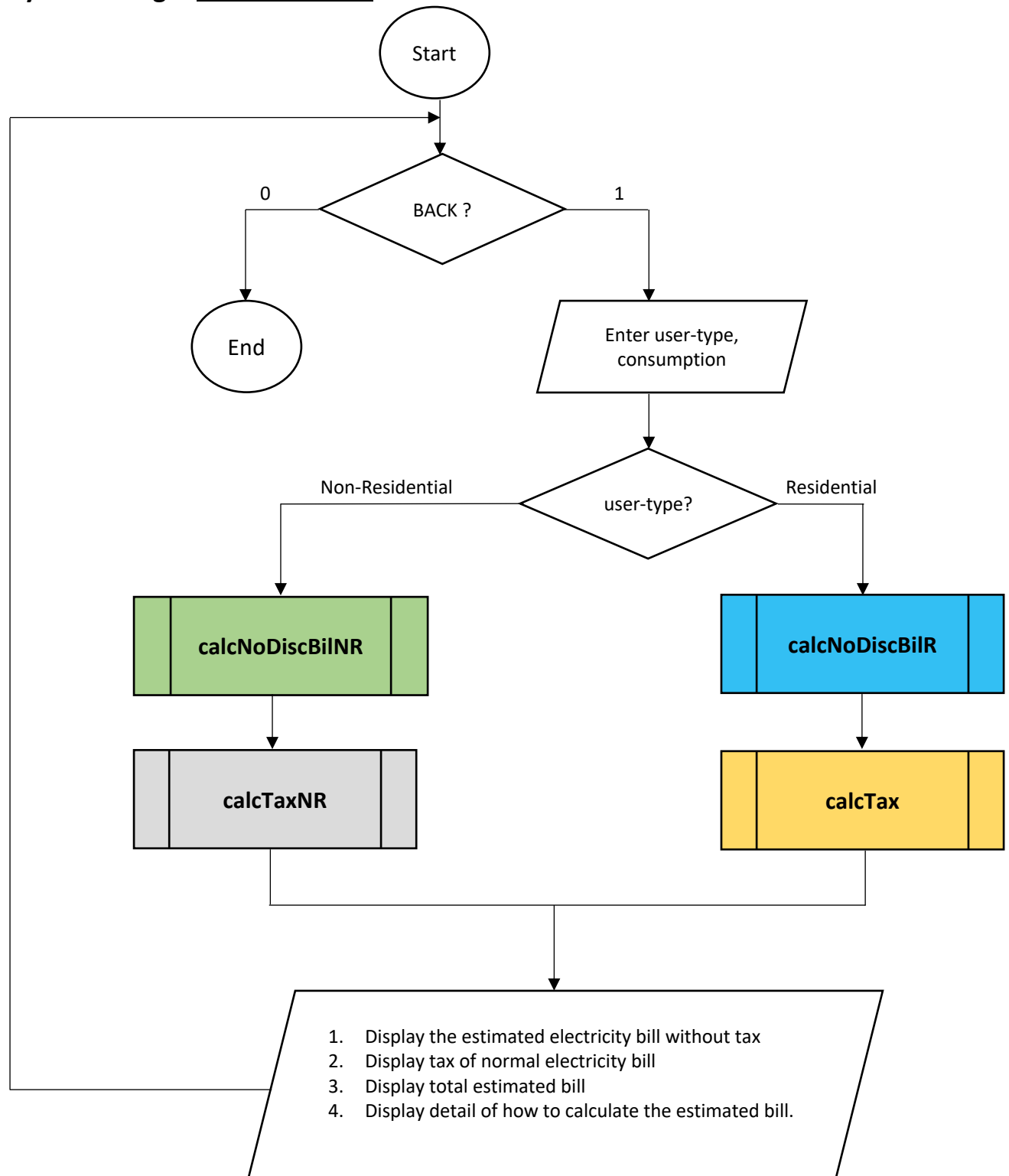
Figure 6: The Input for Non-Residential

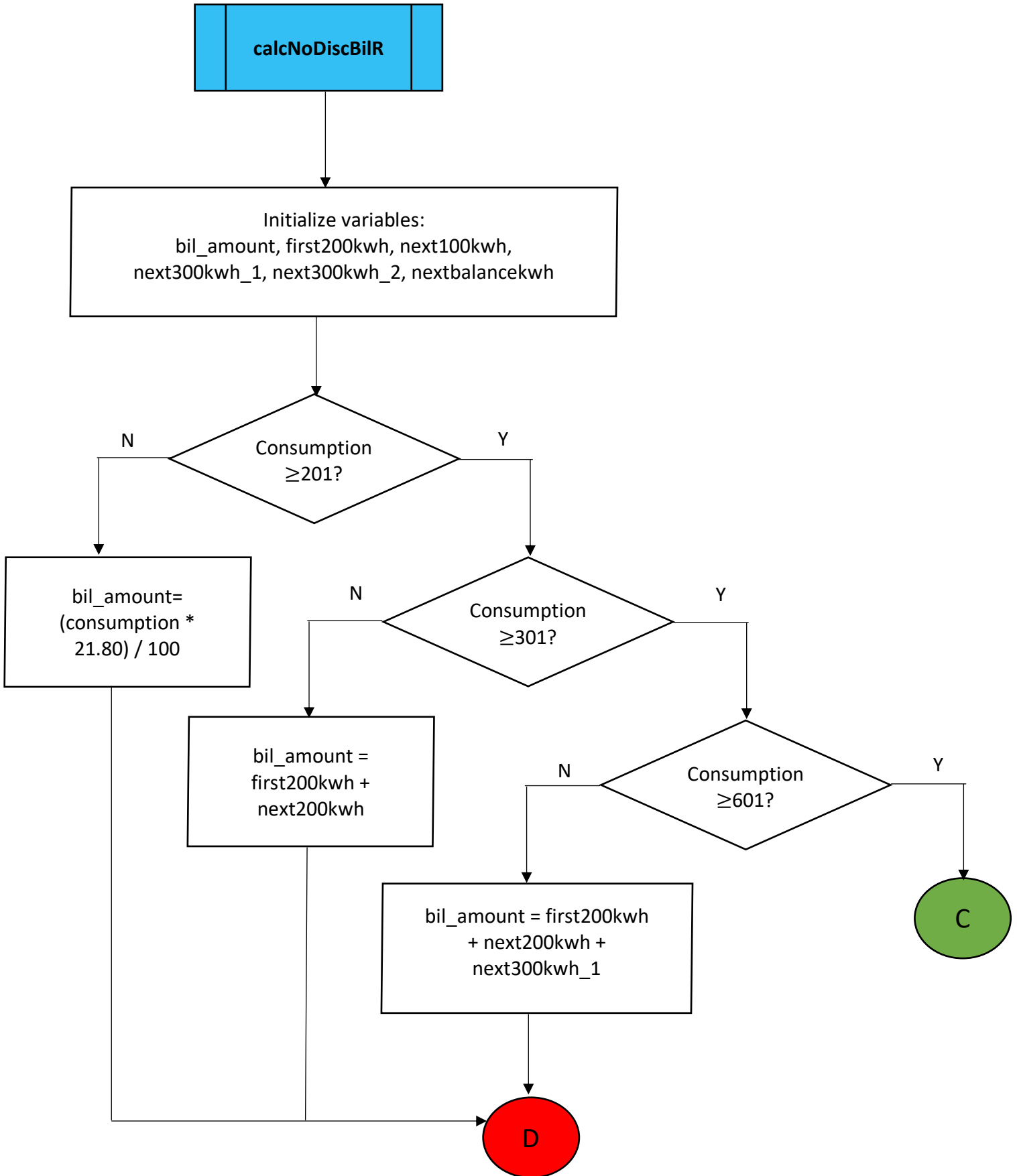
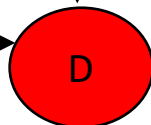
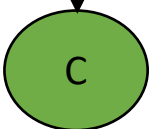
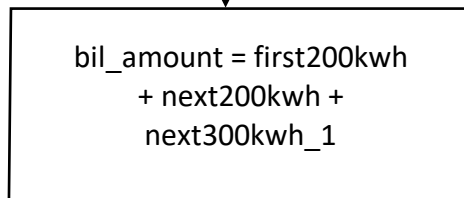
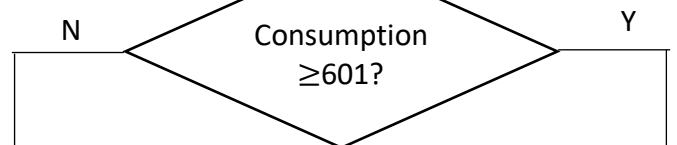
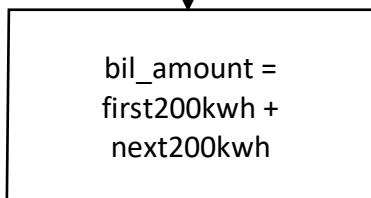
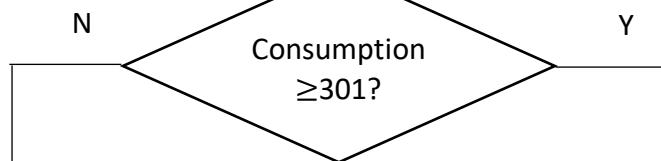
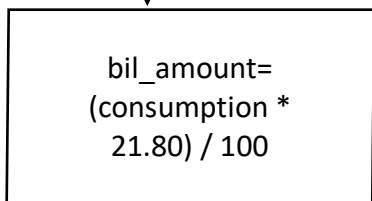
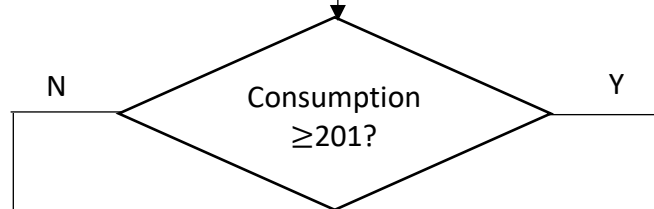
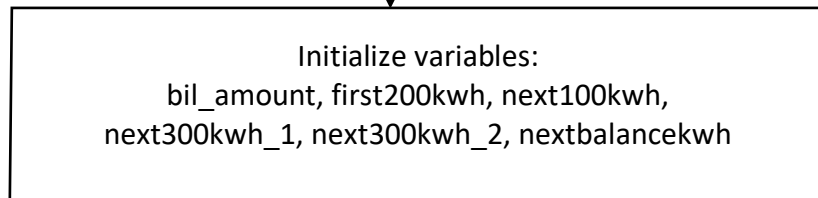
The screenshot shows the same web browser window, but now displaying the calculated electricity bill. The form fields remain the same, but the "Electricity Consumption" field now contains the value "1010". Below the form, the following information is displayed:

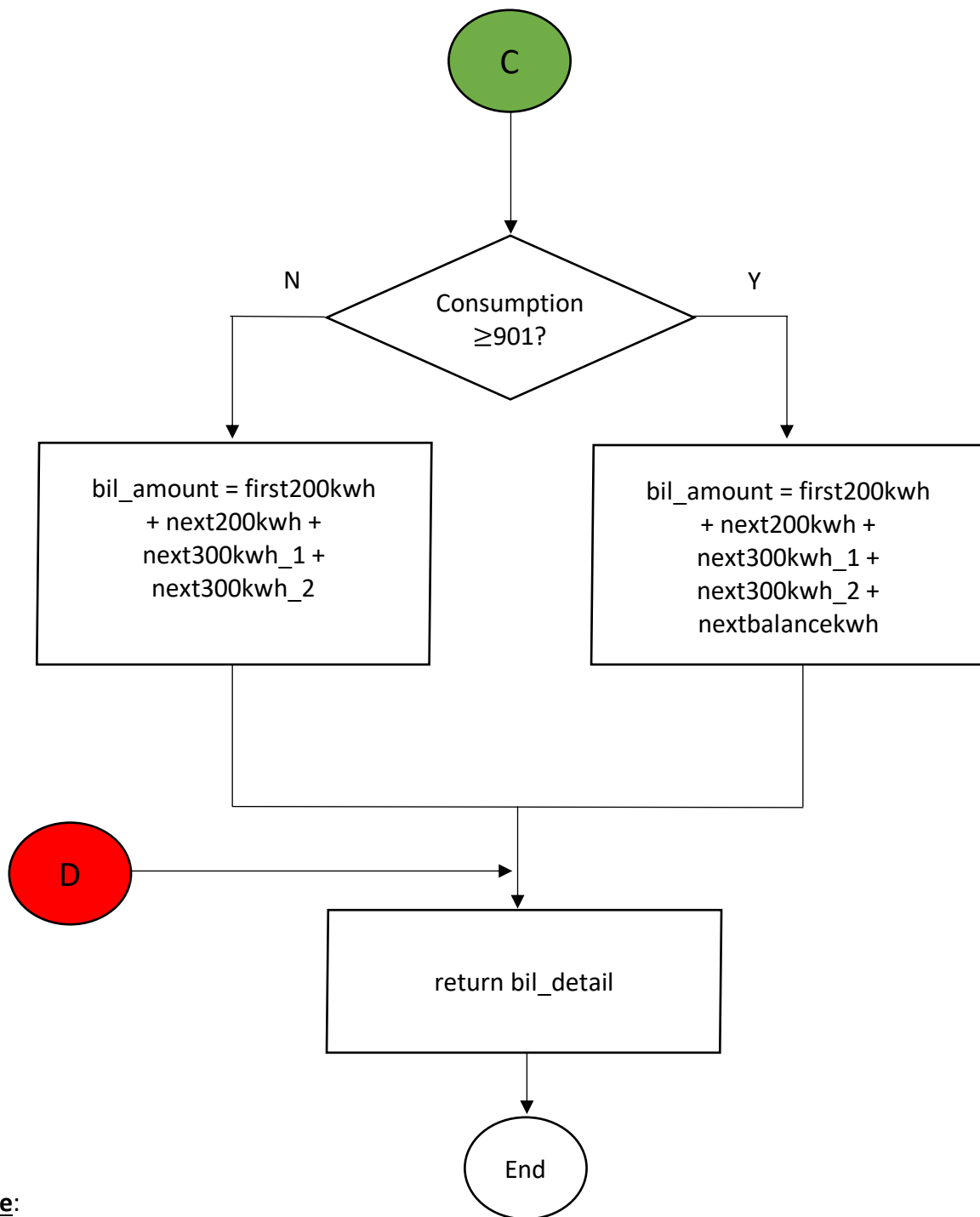
- Estimated Electricity Bill for this Month**
- *****
- Your Electricity Bill: 499.29
- Your ICPT (RM0.0135 per kWh): 13.64
- Your Total Bill: 512.93
- Detail Calculation of Your Electricity Bill**
- *****
- 1.First 200 kWh(1-200 kWh): 87.0
- 2.Next 901 kWh onwards: 412.29
- Back** (red button)
- Wed May 19 2021 13:03:56 GMT+0800 (+08)

Figure 7: The sample output for Non-Residential

System Design: System Flowchart







Note:

1. $\text{first100kwh} = (\text{consumption} * 21.80) / 100$
2. $\text{next200kwh} = (@\text{consumption} * 33.40) / 100$
3. $\text{next300kwh_1} = (@\text{consumption} * 51.60) / 100$
4. $\text{next300kwh_1} = (@\text{consumption} * 54.60) / 100$
5. $\text{nextbalancekwh} = (@\text{consumption} * 57.60) / 100$

@consumption – electricity consumption after deduction previous consumption

