**CS 1050 Homework Assignment 1**

**Electricity Bill Calculator**

**Spring-2017**

**Due**: **10th February, Friday 5:00 PM (No Extension). Submission system shuts off at 5pm.**

**Directions**

Complete the following homework assignment using the description given in each section.

**Purpose**

• Perform basic I/O operations using scanf and printf functions

• Use conditional statements to perform error check.

• Perform simple mathematical calculations.

**Submission information:**

Submit this assignment by following the instructions given below. SUBMIT ONLY the .c file (no a.out or executable file is required). Use the following submit command.

**Filename must be**: *sectionletter-hw1.c* (Include your respective lab section)

e.g.: c-hw1.c  
$ submit <class> <assignment> <filename>

e.g.: $ submit CS1050 HW1 c-hw1.c

**Description**

City of Columbia calculates the monthly Electricity utility bill based on the number of units consumed. It has divided the users into 3 categories, Residential, Commercial and Industrial. Based on the type of connection the rates vary. The bill depends on the number of units consumed, which is read in kWh (kilowatt-hour). The total bill consists of two parts. Part 1 is the ***Energy Charge***, the table below shows the slab rates for consumption for each type of connection. Part 2 is the ***Customer Charge***, the City of Columbia charges a fixed amount every month of $25 for Residential connection, $90 for Commercial connection and $850 if it is an Industrial connection.

**Example**: If Shakespeare’s Pizza, which comes under Commercial Connection, consumed 700kWh during the last month, based on the table below their rate is 14c / kWh.

Energy Charge= units consumed\*(rate/100)

Energy Charge= 700\*.14= $98

Total Bill = Energy Charge + Customer Charge

Total Bill= 98+90= $188

Develop a program in C that will input units consumed for the previous month and will calculate and display bill for that particular connection as shown in the sample output below. To begin, read a connection type from the user 1 for Residential, 2 for Commercial and 3 for Industrial. Assume that the user can enter an invalid input multiple times, so, prompt an appropriate error message until a valid connection is chosen. This error check is shown in the sample output below. Next, read units consumed for that connection, again, perform an error check. A unit is invalid if it is negative (less than zero). Here, again assume that the user can provide an invalid input for unit’s multiple times. Using the connection type, units consumed and the rate from the table below calculate the total bill for Electricity for the user (using the formula above). Make sure the program loops and asks if the user wants to continue to calculate another Bill. If the user hits 1 the calculator should start again for a new bill, if the user hits 0 the program should terminate by showing the proper output (It should show how many times the bill was calculated and what is the grand total of all the bills). Implement the bonus after this. Your results should match the sample output below. Use formatting to print the dollar amount correct to 2 decimal places only.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Residential** |  |  | **Commercial** |  |  | **Industrial** |  |  |
| Lower Bound | Upper Bound | Rate**(in cents**) per kWH | Lower Bound | Upper Bound | Rate(**in cents**)  per kWH | Lower Bound | Upper Bound | Rate(**in cents**)  Per kWH |
|  |  |  |  |  |  |  |  |  |
| 0 | 300 | 7.50 | 0 | 300 | 10.50 | 0 | 300 | 36.50 |
| >300 | 750 | 10 | >300 | 750 | 14 | >300 | 750 | 40 |
| >750 | 1500 | 13.50 | >750 | 1500 | 17.50 | >750 | 1500 | 45.50 |
| >1500 | Above | 15 | >1500 | Above | 20 | >1500 | Above | 50 |
|  |  |  |  |  |  |  |  |  |

**Bonus:** Take a positive number (N) as an input (perform error check), print the numbers and calculate the sum of all numbers from 0 to N, also sum of all even numbers and sum of all odd numbers from 0 to N. (use for-loop)

Eg: Number is 4

0 1 2 3 4

Sum of all numbers is 10

Sum of even numbers = 6

Sum of odd numbers = 4

**Sample Output**

Character in **bold** are inputs from the user

[dpstm3@bengal-vm1 ~]$ ./a.out

\*\*\*\*\* ELECTRICITY BILL CALCULATOR \*\*\*\*\*

1. Residential

2. Commercial

3. Industrial

Choose the type of connection: **0**

Invalid Choice! Please enter a valid choice

1. Residential

2. Commercial

3. Industrial

Choose the type of connection: **4**

Invalid Choice! Please enter a valid choice

1. Residential

2. Commercial

3. Industrial

Choose the type of connection: **1**

Enter the number of units (in kWh): **-111**

Invalid input! Please enter a positive value: **-10**

Invalid input! Please enter a positive value: **300**

Total energy charge for the customer is: $22.50

Total Bill due from this connection is: $47.50

Do you want to continue and calculate another bill? If Yes enter 1 else 0: **1**

1. Residential

2. Commercial

3. Industrial

Choose the type of connection: **0**

Invalid Choice! Please enter a valid choice

1. Residential

2. Commercial

3. Industrial

Choose the type of connection: **0**

Invalid Choice! Please enter a valid choice

1. Residential

2. Commercial

3. Industrial

Choose the type of connection: **2**

Enter the number of units (in kWh): **-99**

Invalid input! Please enter a positive value: **400**

Total energy charge for the customer is: $56.00

Total Bill due from this connection is: $146.00

Do you want to continue and calculate another bill? If Yes enter 1 else 0: **1**

1. Residential

2. Commercial

3. Industrial

Choose the type of connection: **0**

Invalid Choice! Please enter a valid choice

1. Residential

2. Commercial

3. Industrial

Choose the type of connection: **3**

Enter the number of units (in kWh): **-1**

Invalid input! Please enter a positive value: -**500**

Invalid input! Please enter a positive value: **700**

Total energy charge for the customer is: $280.00

Total Bill due from this connection is: $1130.00

Do you want to continue and calculate another bill? If Yes enter 1 else 0: **1**

1. Residential

2. Commercial

3. Industrial

Choose the type of connection: **2**

Enter the number of units (in kWh): **300**

Total energy charge for the customer is: $31.50

Total Bill due from this connection is: $121.50

Do you want to continue and calculate another bill? If Yes enter 1 else 0: **0**

You calculated the bill 4 times and the total amount from all the bills due is $1445.00

EXITING ELECTRICITY BILL CALCULATOR

\*\*\* BONUS \*\*\* **//PERFORM ERROR CHECK**

Enter a number: **5**

The numbers are: 0 1 2 3 4 5

The sum of all numbers from 0 to 5 is 15

Sum of Even numbers = 6

Sum of Odd numbers = 9

**Guidelines for Grading Homework-1**

**60 Points Possible (+5 bonus)**

**General**

***Assignment will not be given any credit (0/60) if your program does not compile or fail to produce any valid output***. Submit the homework assignment to the link provided on the blackboard (similar to the lab assignment) including the lab section in the file name.

**10 points** – Displaying the menu, performing the error check and reading the connection type correctly.

**20 points** – Handling 3 cases (connection) and the different rate slabs for units within each cases correctly.

**5 points** – Error checking for units.

**10 points** – Calculating the Energy Charge and Total Bill correctly.

**10 points –** Program loops accordingly and prints final total.

**5 points** – Displaying all the outputs as shown in the sample output above, writing comments in the code where it is necessary and general coding style.