

Lab 0: Introduction to Lab Equipment

CpE64 Section # 1

Instructor: Telles, Eric

Friday: 4:30pm – 6: 50 pm

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Part 1: Examining the Breadboard

Description:

We try to familiarize our self-trying to figure out how the breadboard works, and which lines of continuity are connected.

Problem Definition:

Your instructor will describe it to you, but you may not understand it until you use it. The breadboard can be set up with both switches (for inputs) and Light Emitting Diodes, LEDs (for outputs). This board is used when for testing circuit designs. The circuit designs and programs should be created prior to coming to lab.

Engineering Data:

After checking out the beard board continuity lines, we were able to figure out that the breadboard is connected different from every section. On the side, with the negative (-) and positive (+) symbol, both relate to themselves. The positive (+) columns have a continuity with itself, the same thing with the negative (-) column. This section is the best place for inserting the power to test the current. In the middle, there are 10 rows labeled: A, B, C, D, E, F, G, H, I, J. there rows are connected vertically in a set of 5 throughout the whole breadboard. For figure 1, it shows the line of continuity of the breadboard.

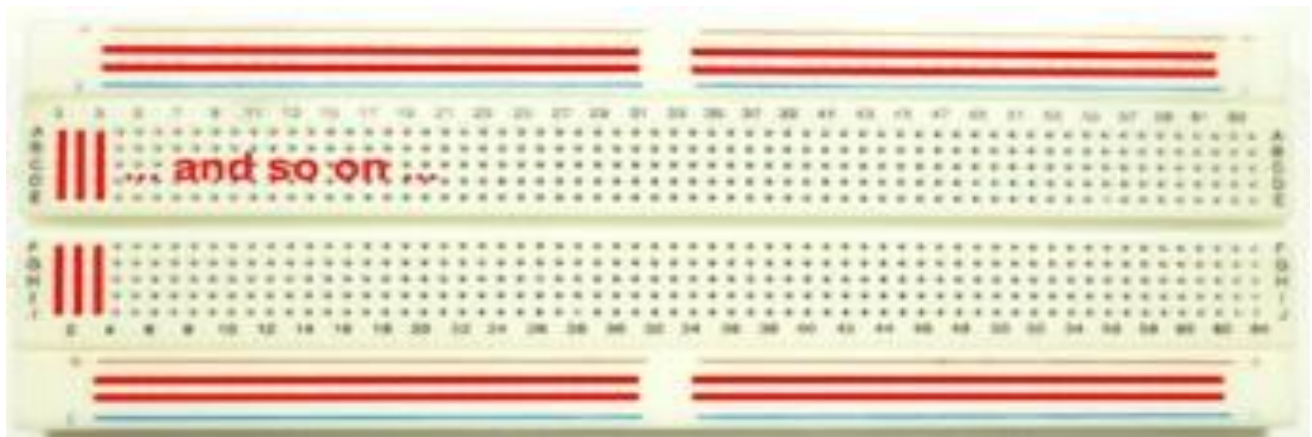


Figure 1

Part 2. Resistor in Parallel and Series, and Buss resistor

Description:

In this part of the lab, we are learning the differences between parallel and series resistor. Also, about how to connect wires that involve the buss resistor.

Problem Definition:

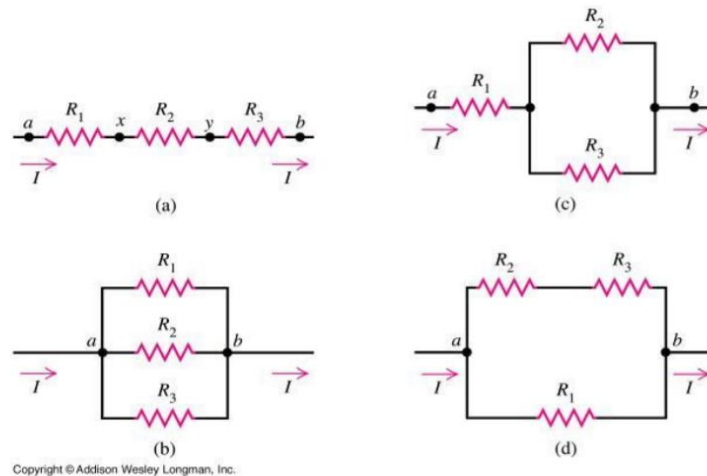


Figure 2

Choose 3 or 4 resistors and measure their resistance compares to the resistor color code. Connect resistors in series and parallel, measure the total resistance and voltages across each resistor with a Digital Multimeter, DMM. Figure 2 was the diagram that was given, which we used to build the breadboard.

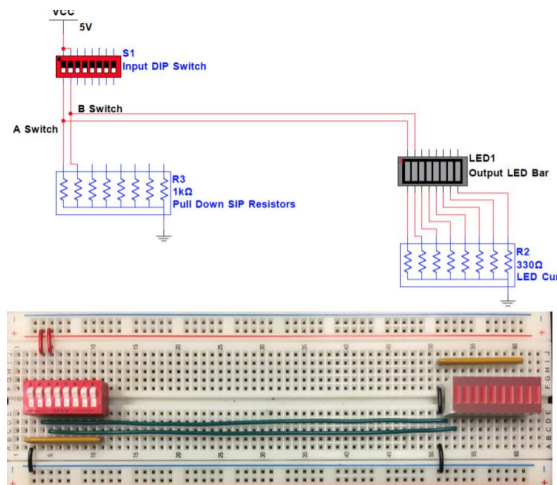


Figure 3

Using the mutisim diagram given, we are to construct the breadboard with the wiring and resistor and get it checked off by the instructor.

Engineering Data:

Data on the Resistor that I used, all the resistor has a gold

Resistor	Color Code	Measured Ohm
R1(red, gray, red)	2700ohm	2.64k ohm

R2(brown, orange, red)	1300ohm	1.26k ohm
R3(brown, black, red)	1000ohm	0.98k ohm

Parallel Series (Figure 4):

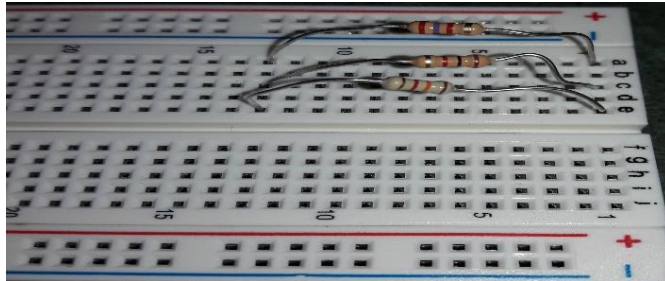


Figure 4

Formula	Calculation	Measured Value
$1/(1/R1+1/R2+1/R3)$	3265.2ohm	3.21k ohm

Series (Figure 5):

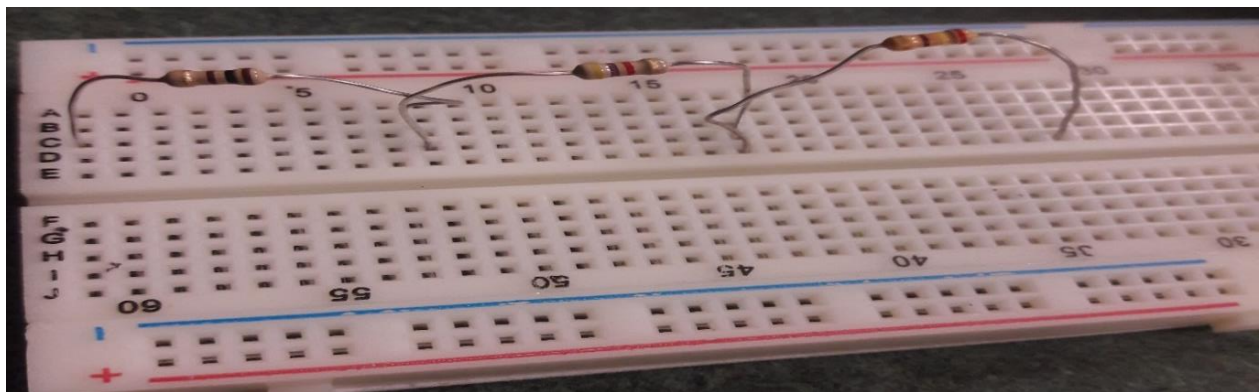


Figure 5

Calculation	Expected Result	Measured Result
$R1+R2+R3$	5.0 k ohm	4.91 k Ohm

Parallel – Series (Figure 6):

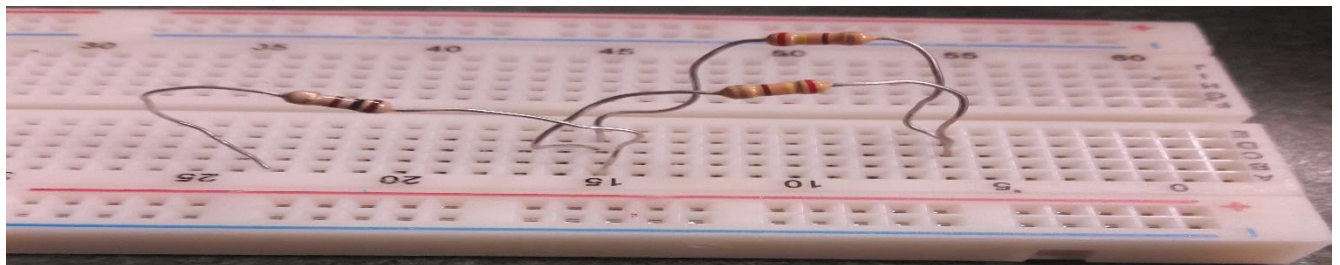


Figure 6

Calculation	Expected Result	Measured Result
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$\frac{1}{\frac{1}{(R1 + R2)} + \frac{1}{(R3+R4)}}$	1877.5 Ohm	1.74 k Ohms
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Series-Parallel (Figure 7):

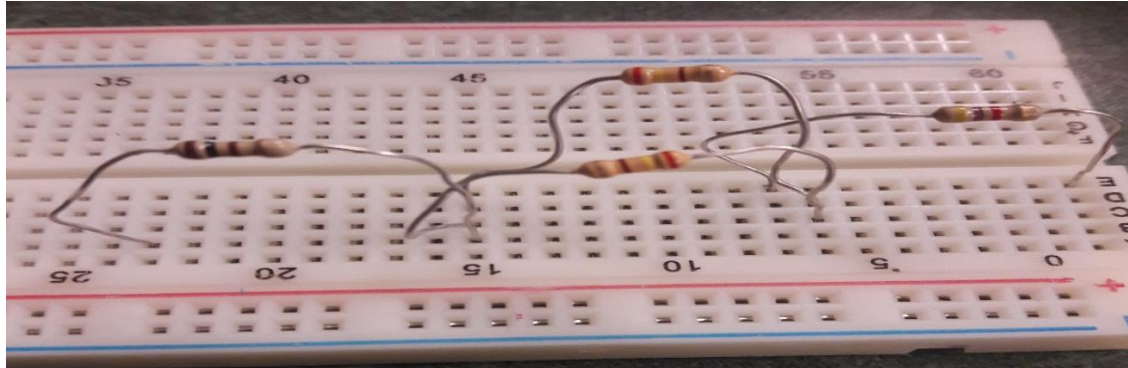


Figure 7

Calculation	Expected Result	Measure Result
$R1 + \frac{1}{\frac{1}{R2} + \frac{1}{R3}} + R4$	467.3 k ohms	0.46k ohm

Bussed Resistor (Figure 8):

Was able to connect all the wiring where it was shown and following the diagram with the two bussed resistors.

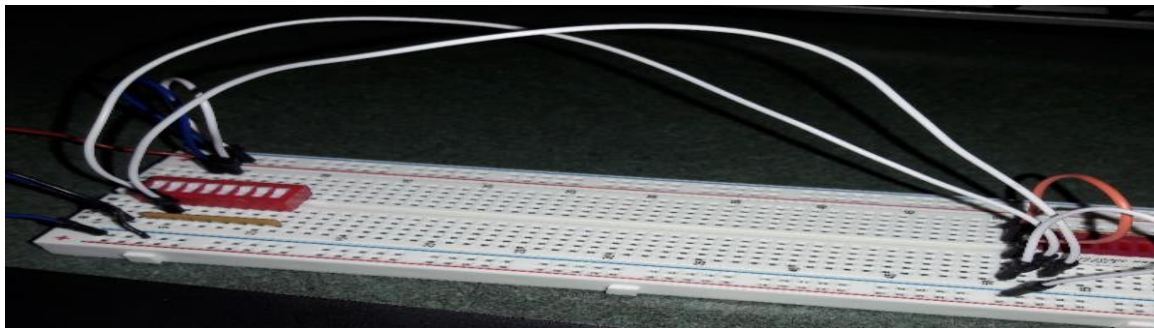


Figure 8

Part 3: LED Light and Bar LED

Description: Learning how to wire up the breadboard to light up a LED light and connecting power supply to breadboard and seeing if I could light up my Bar LED

Problem Definition: Connect a current limiting resistor and LED to light the LED. For the Bar LED and switches connect the switches to the bar LED wired in part 2 on the breadboard, Power the breadboard and verify the LED light when the switch is turn on.

Engineering Data:

The resistor that was used was 459 ohms, tested against a 5V source power source, so the light was dimmed but it works. Featured at figure 9.

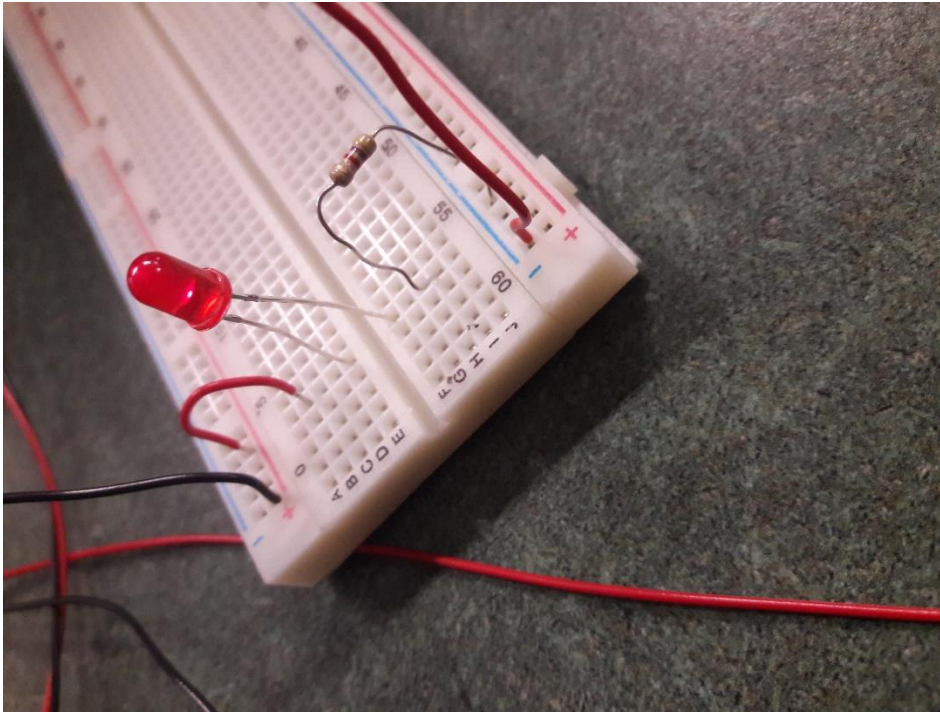


Figure 9

Continuing, we try to light up the Bar LED using two bussed resistors, but seemingly that I got a bussed and isolated resistor only, I must make use of it. When the power is plugged, and the switch are flipped, two led light from the bar are turned on. Shown in figure 10.

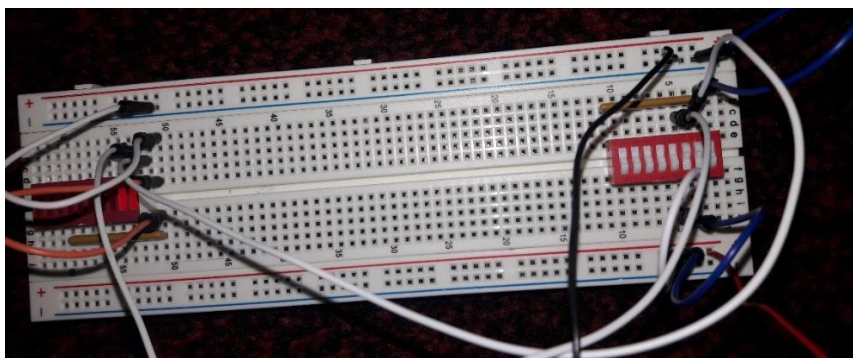


Figure 10

Part 4: Analog Discovery

Description:

This part of the lab is to get yourself familiar with the analog discovery, along with figuring out how the waveform works.

Problem Definition:

Use the Analog Discovery kit and connect it per the instructions in the following videos: Note: The latest versions of Waveforms have changed. Follow the videos and look at images below for the change in the interface.

<http://www.youtube.com/watch?v=aYgFKIsrOYQ>

<http://www.youtube.com/watch?v=Gdl7hPFaPWI>

<http://www.youtube.com/watch?v=Va1lURqbmew>

Engineering Data:



Figure 11

For this part of the lab, I used the analog discovery 2 (figure 11), since the first analog discovery isn't being manufactured anymore. By following the video that we are given, we must test the

voltmeter of the breadboard that we have to set up with a LED light and a resistor (figure 12).

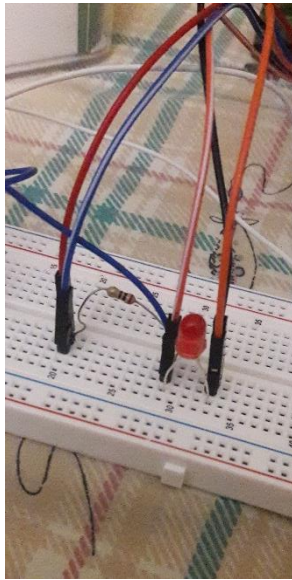


Figure 12

We must use the analog discovery along a program called Waveforms, which was already installed into the school computer. We use Waveform to power our breadboard bar led. By setting power to 5v, by checking the voltmeter (figure 13) we were able to tell how much voltage is being lose through the resistor and how much is going through to the led. By adding channel 1 and channel 2 together, we can get a total of 5 volts.

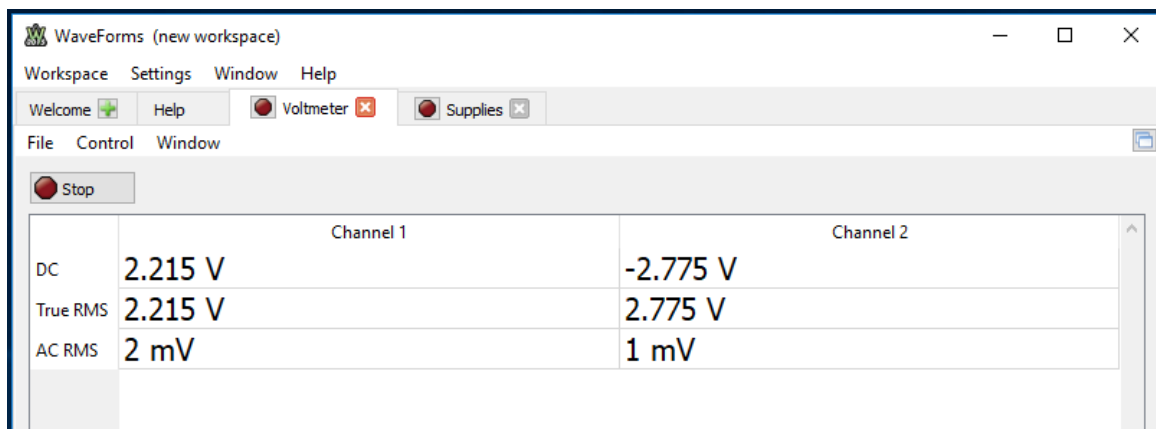


Figure 13

Part 5: Multisim

Description:

An introduction on how to use Multisim, trying to figure out how to replace and move around the components

Problem Definition:

Use Multisim to create “breadboard” schematic of 7400 NAND Gate IC. 7400 Data sheets. Use Multisim for the schematic drawings for this lab.

Multisim tutorials:

What is NI Multisim? http://www.youtube.com/watch?v=vyy_5t2QMCQ

Logic Gates Testing using Multisim: <http://www.youtube.com/watch?v=1pVcys-3qS0>

Multisim Logic Simulation: <http://www.youtube.com/watch?v=R2P3YJkZT6w>

Engineering data:

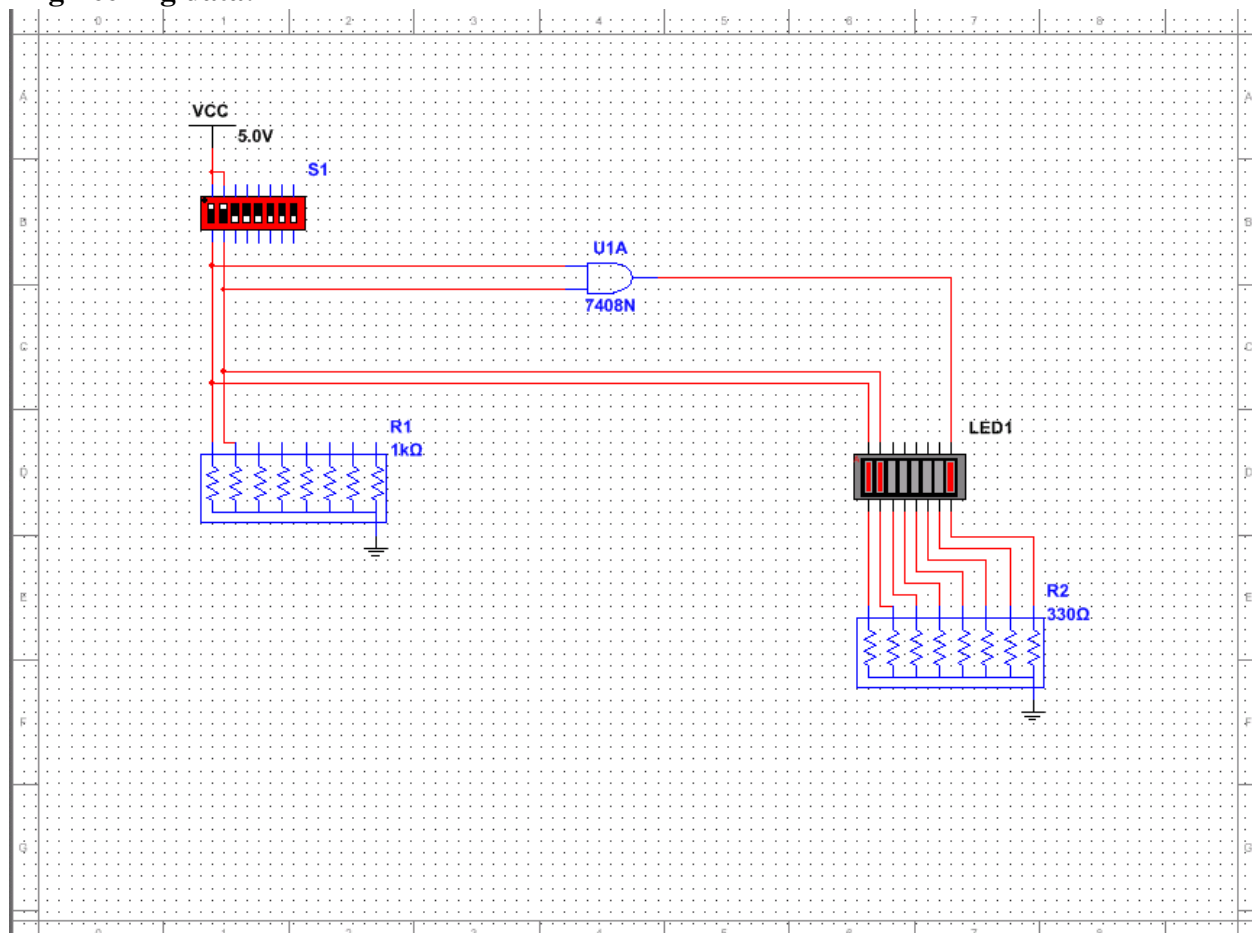


Figure 14

Using the multisim that was given to us, we converted the resistor to a 7408 and gate, then the program was turned on turning on the switch on the led connected (figure 14). For this multisim it is basically a replication of what is supposed to happen on the bread board. When it is one to one. Then light shown is in the picture is what is supposed to be turned on.

Part 6: Fundamental Programming Refresher

Description:

This part of the lab, we are to write some codes in the C language.

Problem Definition:

-Write a program that will display “Hello World” in C language.

Reference: <http://www.cprogramming.com/tutorial/c/lesson1.html>

-Write a program that adds two numbers in C language.

-Write a program that will take a number input between 0 - 9 and displays a message whether the number is less than 5 or greater than 5.

Reference: <http://www.cprogramming.com/tutorial/c/lesson2.html>

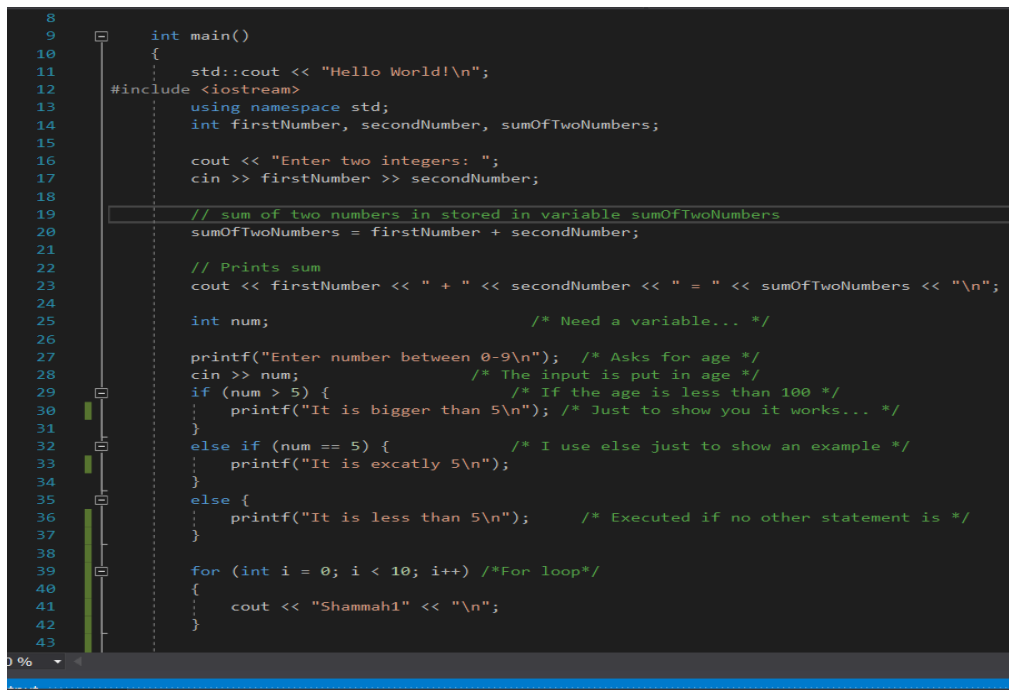
-Write a program that will print your name 10 times using a “for” loop. Repeat for a while, do. While loops.

Reference: <http://www.cprogramming.com/tutorial/c/lesson3.html>

-Write a program that will take a number input between 0-4 and using switch case statement. The program will display a different message for each input.

Reference: <http://www.cprogramming.com/tutorial/c/lesson5.html>

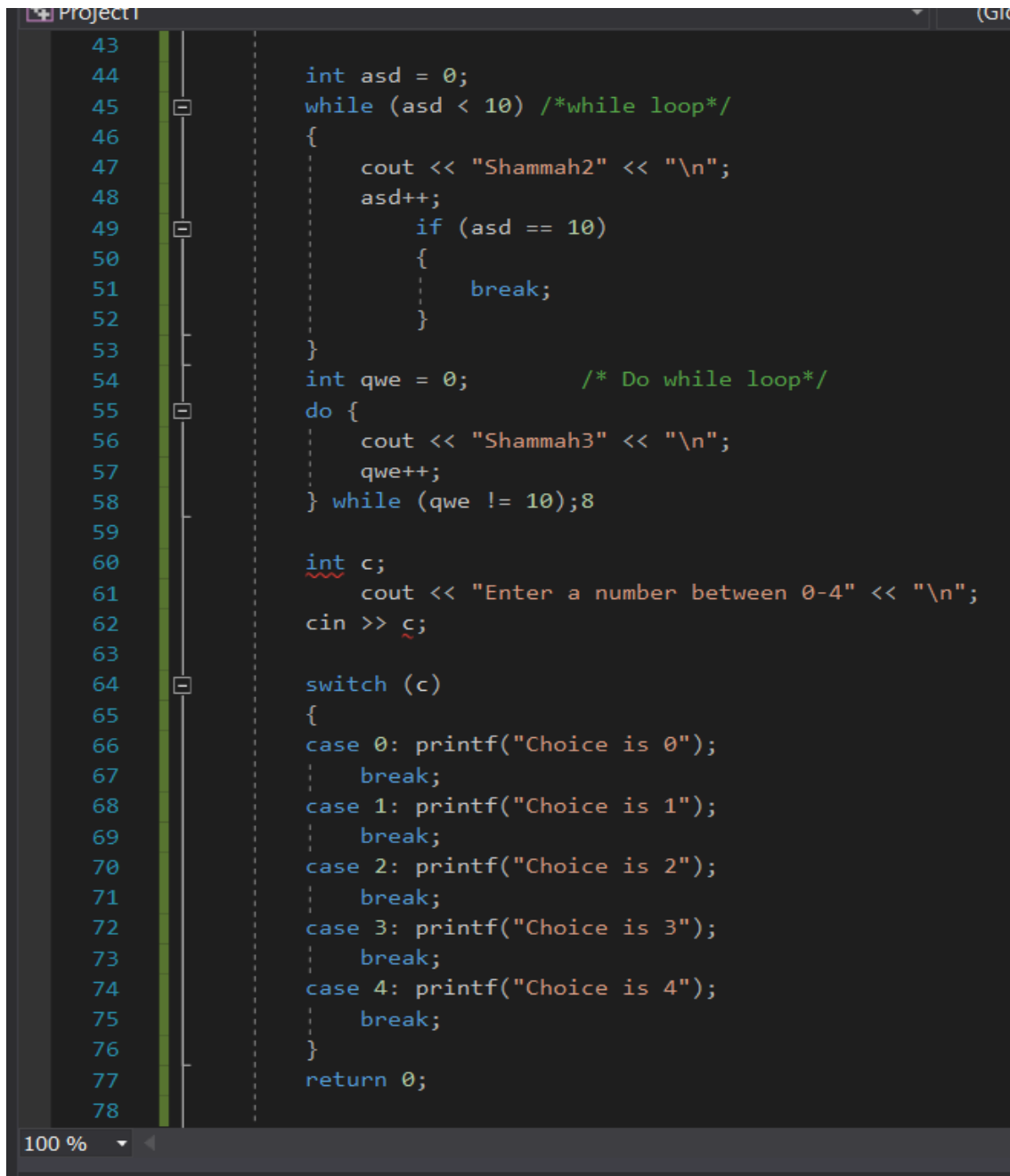
Engineering Data:



```
8
9
10 int main()
11 {
12     std::cout << "Hello World!\n";
13     #include <iostream>
14     using namespace std;
15     int firstNumber, secondNumber, sumOfTwoNumbers;
16
17     cout << "Enter two integers: ";
18     cin >> firstNumber >> secondNumber;
19
20     // sum of two numbers in stored in variable sumOfTwoNumbers
21     sumOfTwoNumbers = firstNumber + secondNumber;
22
23     // Prints sum
24     cout << firstNumber << " + " << secondNumber << " = " << sumOfTwoNumbers << "\n";
25
26     int num;
27     /* Need a variable... */
28     printf("Enter number between 0-9\n"); /* Asks for age */
29     cin >> num; /* The input is put in age */
30     if (num > 5) { /* If the age is less than 100 */
31         printf("It is bigger than 5\n"); /* Just to show you it works... */
32     }
33     else if (num == 5) { /* I use else just to show an example */
34         printf("It is excatly 5\n");
35     }
36     else {
37         printf("It is less than 5\n"); /* Executed if no other statement is */
38     }
39     for (int i = 0; i < 10; i++) /*For loop*/
40     {
41         cout << "Shammah1" << "\n";
42     }
43 }
```

Figure 15

For figure 15, was a picture on my code on printing out "hello world", adding up two number and taking a number between 0 – 9 and displaying if it is less than or greater than 5. It also have the code for the if and for loop which print out my name.



```
43
44     int asd = 0;
45     while (asd < 10) /*while loop*/
46     {
47         cout << "Shammah2" << "\n";
48         asd++;
49         if (asd == 10)
50         {
51             break;
52         }
53     }
54     int qwe = 0;          /* Do while loop*/
55     do {
56         cout << "Shammah3" << "\n";
57         qwe++;
58     } while (qwe != 10);8
59
60     int c;
61     cout << "Enter a number between 0-4" << "\n";
62     cin >> c;
63
64     switch (c)
65     {
66     case 0: printf("Choice is 0");
67             break;
68     case 1: printf("Choice is 1");
69             break;
70     case 2: printf("Choice is 2");
71             break;
72     case 3: printf("Choice is 3");
73             break;
74     case 4: printf("Choice is 4");
75             break;
76     }
77     return 0;
78
```

Figure 16

For figure 16, this is featuring the while loop and the switch case. Both print out my name 10 time but since it might be confusing with my name being repeated 10 the same. I added a number so it will be easier to recognize that the name is from a different loop

```

Hello World!
Enter two integers: 5 2
5 + 2 = 7
Enter number between 0-9
5
It is excatly 5
Shammah1
Shammah1
Shammah1
Shammah1
Shammah1
Shammah1
Shammah1
Shammah1
Shammah1
Shammah1
Shammah2
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Shammah3
Shammah3
Shammah3
Shammah3
Enter a number between 0-4
2
Choice is 2
c:\Users\shamm\source\repos\Project1\x64\Debug\Pr
To automatically close the console when debugging
Press any key to close this window . . .

```

Figure 17

Figure 17 is just showing the output from the code featured in figure 15 and 16.

Conclusion:

In this lab, we started to learn about the breadboard and the other components such as the analog discovery, multisim and coding in C language. The experience in this lab was okay, it was a good start with this start of the lab class. Like how we got to get use to how the breadboard works, along with how to connect wire to light up an LED light and LED bar. There was one issue with my led lighting was because I wasn't using two bussed resistors instead, I must use what I had which was one isolated and one bussed. So, when I turn on the power for my LED, two light lit up and it doesn't switch. This lab helps with the concept of binary number, 0 and 1, off and on for the switch to power the led