Lab 3

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Prelab:

A picture containing diagram

Description automatically generated

Purpose:

The purpose of lab 3 was to learn how to use the Xilinx Vivado software by implementing a full subtractor.

Lab Procedure:

We started the lab by opening Vivado and creating an RTL project that was set to ‘VHDL’ target language. We continued by creating a design source file called FullSubtractor with I/O ports for the file. The inputs were a, b, and c and the outputs were diff and bout. We then wrote 2 lines of code that would simulate the boolean expressions for diff and bout from the prelab.

Next, we created a simulation file titled full\_subtractor, copy and pasted the I/O from FullSubtractor into full\_subtractor, created std\_logic signals for the inputs and outputs, and also added a port map to FullSubtractor. Finally, we added our 8 test cases from the prelab into the program.

We then ran the Behavioral Simulation and took note of the waveform output, created one final program that would allow us to enter our inputs on a Basys 3 board, then ran Synthesis, Implementation, and finally Generated Bitstream. We then connected the Basys 3 board to the computer and manually tested the outputs on it.

Vivado Code-

Graphical user interface, text, application

Description automatically generated with medium confidence

Graphical user interface, text, application

Description automatically generatedGraphical user interface, text, application

Description automatically generated

Basys 3 Board-

Input: 111

A picture containing text, electronics, circuit

Description automatically generated

Input: 110

A picture containing text, electronics, circuit

Description automatically generated

Input: 101

A close-up of a circuit board

Description automatically generated with medium confidence

Input: 100

A close-up of a computer chip

Description automatically generated with low confidence

Conclusion:

In this lab, we learned to use the Xilinx Vivado software by implementing a full subtractor. The results of this lab proved that for the inputs 001, 010, 100, and 111, there was a high output for the difference output and for the inputs 001, 010, 011, and 111, there was a high output for bout. We were able to manually test these with the Basys 3 board which had switches we could move between high and low input.

Finally, I believe physically constructing a circuit is more beneficial to my learning.

Observations:

The main observation I have to improve my performance on future experiments would be to become more acquainted with how inputs are entered on digital circuits boards( for example the input 011 would be entered 110 on the board because it is in reverse order).