

ELEC-4200

Digital System Design

FROM: Jacob Howard

TO: Prof. Ujjwal Guin

DUE DATE: 4/8/21

Final Project Pre-Lab

Introduction

The goal of this report is to explain my Final Project for Digital System Design (ELEC 4200). For our final project, we were able to choose a design of our own as long as no one else was doing the same project and it was approved by Dr. Guin. For my Final Project Design, I chose to design a stopwatch.

Design

Initially, for my stopwatch design, I will implement a delay loop that will occur every millisecond. The delay loop will be used before each iteration of the stopwatch code. This will ensure that one millisecond of time will pass before a new time variable is displayed. I will implement dummy tests to ensure that millisecond and second timings are correct. An alternative to a delay loop within the code is having a correct clock cycle. I could implement a clock that pulses every millisecond. I am not sure whether a delay loop or clock cycle will work better until testing.

Next, I will implement the 7-segment displays to display the correct numbers every millisecond. I am uncertain as to how many displays I will use, but I will at least use three 7-segment displays. The first two displays to the right will display millisecond time, and then the last will display time in seconds. If I can get three displays working properly, I will also try to implement a fourth display for the double-digit time in seconds.

Once I get the displays properly working, I will need to come up with a way to add up the time properly. I believe this to be the most challenging task. For the millisecond section, I will need the first display to add up to 9, then carry. Once the second (10s place) millisecond time display is at 60 milliseconds, I will need to carry and reset the milliseconds to both zero. I

believe this to be the most challenging part of the code, as the first section will carry after 9 like usual, but the tens place will have to carry once it is at 6. An alternative and more hard coding way of solving this issue would be to use ROM. If I cannot get the adders to work correctly, I could have the code read off a line from a ROM file every millisecond. The problem with this is it will be a long process to write every time too many lines in the ROM file and the stopwatch would only be able to count time for a finite amount.

Lastly, the only other part I believe I will need to implement is start, stop, and reset buttons or switches. I believe switches would be easier to implement in the code, but buttons would be preferred for this type of design.

Conclusion

In conclusion, I believe after going through my design steps, I will be able to create a working stopwatch using digital design in Verilog. There also may be other ways of designing the stopwatch that I have not thought of yet, so it is possible that I may design the stopwatch differently from my current design plan. I do believe I will encounter some problems during my design, but I believe I can get a working stopwatch for the final design lab.