**CPU Design Project - Final Report**

Spring 2011

(a) What did you learn from this project?

During the implementation of this project, I learned several design techniques as well as verification techniques of a VHDL design. Some design techniques included implementation of a finite state machine for the control unit, timing validation for the various registers in the design, and hierarchical modeling to connect the many components together into one working Top Level design. This project; however, taught me the most during the verification stages. I have learned an abundant amount of information about ModelSim, which includes but not limited to creating and adding libraries to a project, and different simulation functionalities such as adding signals to a list/wave, and using .DO files. Moreover, working with Quartus taught me the intricacies of the Altera DE2 board.

(b) What would you do differently next time?

If I could do something differently next time, I would start earlier on each part of the project instead of wait until a couple of days before they were due. I found out that it was really important that each part of the project was as detailed as possible, so that the subsequent parts would be easier to implement, especially for part three, four, and five. I would also make my instruction set more simple and smaller. It turns out that several of my instructions were redundant and not needed, such as subtract immediate (An add immediate instruction could accomplish the same thing by adding a negative immediate value). If I had to change datapath designs, I would try to implement a pipeline datapath. The reason I implemented the multicycle datapath is because I saw it to be harder than the single cycle design, but easier than the pipeline design. Next time, when I have more time for designing and implementing, I would want to challenge myself to the harder pipeline design.

(c) What is your advice to someone who is going to work on a similar project?

I advise students who are going to work on a similar project to think and do several things before, and during each part of this project. Having the project separated into individual parts made it really easy to plan out a schedule to complete the project. However, I advise students to not just look at the current part of the project that they might be working on but also look ahead at the upcoming parts. By doing this, the student will be able to design and implement the project more efficiently. Also, I would advise the students to start as early as possible and to try to not fall behind. Roadblocks are inevitable, so the student must plan enough time to resolve such issues. If the student is confused or is having trouble debugging the design, I would advise that student to try their best to understand and solve the problem by themselves, and if they are not able to resolve to problem then ask the Teaching Assistance for guidance.