Helpful Hints for the Capstone Project Lab

Assumptions

1. The benefit of the assumptions task is for you to tell the grader: "These are the limitations of the machine that I am going to build".
2. Assumptions list is like a "Users' Manual" of how to operate the machine that you built. It should be given to the user to let them know the DO's and DONT's.
3. We don't want a large list of assumptions. 2-3 assumptions are enough.
4. You don't have to list the assumptions before finishing your design. You might need to modify it while designing your machine. That is the nature of any design process.
5. Some of your assumptions for Design 2 could be the same as those for Design 1, but not all of them.
6. Answers to (some) the following questions might be good candidates to be your assumptions:
    a. Does your machine need/use an asynchronous reset?
    b. What should the state of the system be if the power is being applied for the first time?

Check List

1. First step is to define the inputs and outputs of your design, as well as the values that each input and output might take.
2. Make sure you have listed your assumptions for your project.
3. Make sure your state diagram is complete: no missing arrows/states/inputs/outputs.
4. Make sure your state diagram is readable: Which value mentioned on the arrow corresponds to which input.
5. If you design a Mealy machine, think about whether you need a synchronization flip flop at the output of a Mealy machine.
6. If your system has more than one input, which one is what (on your state diagram)? (Also don't forget to name your input signals. Graders might consider your files not working if you did not label your input signals.).
7. When filling in the column of the output in the Moore transition table, you need to look at the present state not at the next state because in a Moore state transition table, the output depends on the present state and not the next state. Thus, if you found your output changes with the change in the input when you simulate your Moore circuit, then you have probably missed this fact.
8. Any state diagram should be complete: Each state has to have 2^n arrows coming out of it, where n is the number of inputs to the system. This is the case for both the Mealy and the Moore machine. (Remember one arrow can represent multiple arrows if one, or more, inputs don't affect the next state or outputs.)
9. Don't forget to connect unused Set and Clr inputs of your flip flops to Ground while you build your schematic.
10. Do not build the FFs from scratch when simulating your design. Use the asynchronous FFs available in Digital. They are found under the "Components -> Flip-Flops" menu.

You are asked to *record a video demonstration of one of your designs*, so you need to choose one of them. Which one will you choose? You have to think about some criteria upon which you decide

which design to build. These criteria differ from one student to another. It may include (but is not limited to):

1- Number of gates
2- Number of flip flops
3- Number of wires (tedious to count)
4- Your understanding to the machine
5- Is it working?
6- Amount of time needed to build it on Hardware.

You need to give a weight to each criteria based on how important you think this criteria is (for example: I care about the cost more than I care about the time needed to implement the system, thus, I will give criterion 1 more weight than criterion 6. The sum of weights should add up to 100. Then, I start dividing these weights among the Moore and the Mealy. For example, my weights are:

1- 60 ----> (out of the 60, I will assign 40 points for the first design and only 20 for the second since the second requires more gates).
2- 10 ----> (7 and 3)
3- 0
4- 20----> (5 and 15)
5- 0
6- 10

Then you add the weights for the 1st design and compare them with the sum of the weights for the 2nd. The design giving you higher aggregate weight wins. Note that you don't have to use all these criterion (this is why some of them have 0 weights indicating that I don't care about these criterion). So it's up to you what to choose. Feel free to add more criteria that you care about. The weights do not have to be numerical, although numerical weights will allow you to arrive at a quantitative answer. If you want to arrive at a qualitative judgment, you might choose a weighting system such as 'very important', 'important', or 'somewhat important'. Use a table to show your criteria and weights.

Guidelines

Read the following guidelines to get the most out of this project.

1. DO NOT submit a project other than the one assigned. If you happen to know what projects we assigned to students in previous semesters, DO NOT submit their project. This is considered an academic integrity violation that will NOT be tolerated. It will be reported to the Academic Integrity Office. No exceptions!
2. Your design has to be synchronous which means that all clocks of all FFs have to be connected to a single clock input. This clock input should not be connected to anything else. Asynchronous designs will not be accepted.
3. Start ASAP because, unlike previous labs, the project doesn't have step by step procedure.
4. You might need 5-variable K-maps to finish this project completely. Contact your instructor if you don't know how to use them.
5. Although we allow and encourage cooperation and discussions, inside or outside the discussion board, we will not tolerate copying or sharing reports and Digital folders. Even if there might be some similarities between your design and the designs of your peers, your solution has to be written by yourself in your own way of presenting it. Ideas allowing you to understand the project can be shared, solutions cannot.
6. If you scanned/photo'd your handwriting to include it in your report, make sure the scanned version is clean and the grader can read it easily.

7. If your design is not working in simulation, make sure to include in your report what the problem is (i.e. how it is working), and what solutions you could have pursued if you had more time to spend on the project. Please note that the important outcome of this project is your ability to show how much you understand what you are doing. The grader will deduct points depending on how much they see you have accomplished in this project. A working design is not the main goal of the project (although it is important), a deep understanding of the system is.
8. Make sure you have included two designs in your report. We always ask students NOT to just add hardware to one of the designs to make it look different. Rather we ask them to start from scratch and make use of the systematic procedure that we teach them in class to build the second design.