ECE255 Lab 3

Design a counter with the following specifications:

a. counts from 0 to 99.
b. cycles back to 0 when it reaches 99 and resumes counting.
c. output to the 7 segment LEDs.
d. Has a way of advancing quickly from 0 to 99 (for TA checkoffs).
e. Has a way to synchronously reset the counter to 0
f. Implemented in VHDL

Documentation

Your report should include:

a. TA or instructor signature to verify it works,
b. Block diagram,
c. VHDL code, clearly written,
d. Brief description of how it works, including a "user's" manual that tells the TA how to operate the counter.

You do not need to present a circuit schematic for this lab.

Extra Credit Opportunities

a. **10 points**: Add a switch that allows the counter to be either an up counter (input 0) or a down counter (input 1). The down counter should count down from 99 to 0. When the switch is flipped, then the counter should immediately reverse its count without resetting to either 0 or 99. For example if the switch is flipped from up to down when the count is 50, then the counter should immediately start counting down from 50.
b. **25 points**: Use the 8 switches on the bottom left side of the BASYS board to allow the user to pre-set the counter with a specific value. The left four switches should allow the user to input the tens digits in binary and the right four switches should allow the user to input the ones digit in binary. Note that 4 switches equates to four binary bits that can represent a number from 0-15. The digits from 10-15 should be don't care conditions, although you will need to translate them to a digit. You will probably need to use a pre-set button that loads the numbers into the counter when the pre-set button is pressed.

If you do both extra credit problems, it is okay to do them separately with two different circuits. Alternatively you can put both options in the same circuit. If you do that and do not have a switch for the up-down counter, it is okay to use a button that toggles between up and down counting.