University of British Columbia
Electrical and Computer Engineering
Digital Systems and Microcomputers
CPEN312

Lab 2 - Arithmetic

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In this laboratory you will be implementing adders and subtractors for both binary and BCD numbers. NOTE: Assume for this lab that all the input numbers are positive and all the results are also positive. Also feel free to use either VHDL, gates in the graphic editor, or a combination of both.

Tools and Equipment Needed

1. Altera DE0-CV board.
2. Quartus Prime version 16 or newer.

Activities

1) Design, code/draw, and test using the Altera DE0-CV board an 8-bit binary added/subtractor. The first 8-bit binary number (A) is input using SW7 down to SW0 and latched when KEY1 is pressed. The second 8-bit binary number (B) is also input using SW7 down to SW0 and latched when KEY0 is pressed. Use SW9 to select between addition (A plus B) and subtraction (A minus B). Display the result of the selected arithmetic operation using LEDR0 to LEDR8. Since latches have not been covered in the lectures yet, an example is provided in the course web page for you to use.

2) Design, code/draw, and test using the Altera DE0-CV board a 2-digit BCD added/subtractor. The two BCD digits of the first BCD number (A) are input using SW3 down to SW0 for the least significant BCD digit, and SW7 down to SW4 for the most significant BCD digit and latched when KEY1 is pressed. The two BCD digits of the second BCD number (B) are input using SW3 down to SW0 for the least significant BCD digit and SW7 to SW4 for the most significant BCD digit and latched when KEY0 is pressed. Use SW9 to select between BCD addition (A plus B) and BCD subtraction (A minus B). Display number ‘A’ using the 7-segment displays HEX5 and HEX4. Display number ‘B’ using the 7-segment displays HEX3 and HEX2. Display the result of the selected arithmetic operation using the 7-segment displays HEX1 and HEX0. Use LEDR3 to display overflow. Demonstrate your results to the teaching assistant on duty in order to get a grade for your work.