

# EE 245

## Digital System Design

### Project 2 – Hex Calculator

The goal of this project is to make a simple calculator which can add, subtract, and multiply two-digit (unsigned) hexadecimal integers. Specifications are as follows:

1. Two two-digit hex numbers are the input for the calculator. They will be entered on the DE2 board as two hex nibbles. Switches  $SW_{15-8}$  will be used to define a two-hex digit number  $B$ , and switches  $SW_{7-0}$  will be used to define the other two-hex-digit number  $A$ .
2. The hexadecimal number  $B$  will be displayed on seven segment displays  $HEX_{7-6}$ , and  $A$  will be displayed on seven segment displays  $HEX_{5-4}$ .
3. When  $KEY_0$  is pressed, the sum  $A + B$  will be displayed on seven segment displays  $HEX_{3-0}$ .
4. When  $KEY_1$  is pressed, the difference  $A - B$  will be displayed on seven segment displays  $HEX_{3-0}$ .
5. When  $KEY_2$  is pressed, the product  $A \times B$  will be displayed on seven segment displays  $HEX_{3-0}$ .
6. When none of the keys are pressed, displays  $HEX_{3-0}$  will be blank (no lights on).

This is an *individual* project, and each student will work on his or her own. You may consult other students for help, but you may not use their code *and you must explicitly reference* (cite) any such help. The lab in Harding 319 will be available for most of the day on Tuesday, April 15th for you to work. You do *not* need to attend at your regular lab time on Tuesday. You may also schedule additional time in the lab as needed. As always, you are encouraged to write *and simulate* your code at home so lab time will be minimized.

These projects must be finalized, and the working code submitted, prior to 11 am on Monday, April 28th. We have labs scheduled for lab time on the 22nd and 29th, but you should also have time to demonstrate your working project to me during lab on April 29th. Note that all students must email the completed Verilog files to [ee245Ldsdsu@gmail.com](mailto:ee245Ldsdsu@gmail.com) before 11 am on Monday. After demonstrating your working project to the instructor you must submit a report detailing your design, test procedure, and results. In addition to the contents of your prior report, you should discuss the *efficiency* of your design, and the time-space trade-offs that were made. Compare the size and speed of your design to those of your classmates and discuss. The report will be graded on your approach, content, style, and delivery and is due on Friday, May 2nd.