

CSCI 210
HOMEWORK ASSIGNMENT 03

4-BIT RIPPLE CARRY ADDER WITH SWITCH INPUTS AND DUAL HEX SSD OUTPUTS

DESCRIPTION

You will create a combinatorial logic device that adheres to the following specifications. It will have 8 inputs and 5 outputs. The inputs are named $A_3A_2A_1A_0$ and $B_3B_2B_1B_0$. They represent two 4-bit unsigned binary numbers A and B . The five outputs, $S_4S_3S_2S_1S_0$, represent the sum $A + B = S$.

PART 1: (1-BIT FULL ADDER)

Write a truth table that completely describes the behavior of a single 1-bit Full Adder (FA), as discussed in class. From there, form two Karnaugh maps, and determine the AND-OR expressions for the minimum sum of products (MSOP) equations for each of the two outputs (sum and carry). Implement FA in a single block diagram file, and then modularize it with generic input and output pin names, and create a symbol file. I recommend you add this symbol file into your library. Write the truth table and Karnaugh maps neatly and cleanly for turning in. They will be due in class on Friday prior to the program submission.

PART 2: (4-BIT RIPPLE CARRY ADDER WITH SINGLE SSD FOR EACH INPUT AND A DUAL
DISPLAY FOR OUTPUT)

Open a new block diagram file, and make this new file the top-level entity using the IDE. This is where you will use 4 of your FA's to build the overall 4-bit ripple carry adder. Map $A_3A_2A_1A_0$ to $SW[9..6]$ and $B_3B_2B_1B_0$ to $SW[3..0]$. Display input numbers A and B on $HEX5$ and $HEX3$, respectively. You will need to make use of your correct solution (SSD symbols) from HW02 in order to do this. Then tie the outputs (from the sum-bit outputs of the ripple carry adder, as well as the last carry out to form a five-bit output), directly to $LEDR[4..0]$ and as well as to $HEX1$ and $HEX0$ (a dual SSD display capable of displaying 0x00 (the smallest sum) to 0x1E (i.e. $15 + 15$)). You'll need to use two of your SSD decoders to do this and possibly a little cleverness.

SUBMISSION: (NO LATE WORK ACCEPTED)

Prior to the due date and time posted in Moodle, upload your project into Moodle. This will be a zip file which contains the entire project directory structure. Your submission should be named `userid-210-HW03.zip`, where `userid` is your `userid`. Make sure to check two things after submitting your assignment:

- (1) Your file has successfully been uploaded into Moodle.
- (2) Download your file from Moodle, unpack the file, load and execute it on your board. If this doesn't work for me, you will lose significant credit on the assignment.