

CSCI 202 Computer Organization II

Instructor: Gedare Bloom

Homework 1 (25 points)

Due: Friday, January 25 at 11:59 P.M.

You must do this assignment by yourself. Provide detailed calculation and justifications for your numerical answers. Handwritten submissions are acceptable, but must be clear! Equations must be properly type-set including superscripts for exponents. Always watch the course website for updates on the assignments.

Resources

- You may like to use Dia, Visio, or EDA tools (Vivado / Quartus) to draw your circuit block diagrams.
- Appendix B (C in old version) “The Basics of Logic Design” of the COD text.

Question 1 (10 points)

The truth table for a Boolean expression is

Inputs			Output
x	y	z	
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1

Write the Boolean expression in

- (a) sum-of-products form
- (b) product-of-sums form

Question 2 (5 points)

Draw a logic circuit (using AND, OR, and NOT gates) that detects overflow from a 32-bit add/subtract unit. The available inputs are: a_{31} - a_0 (the 32 bits of the “a” operand; with a_{31} being the MSB and a_0 being LSB), b_{31} - b_0 (same for the “b” operand), r_{31} - r_0 (the 32 bits of the result), and an S input, where $S = 0$ represents an addition operation ($a + b$), and $S = 1$ represents a subtraction operation ($a - b$).

Question 3 (10 points)

- i. Draw the block diagram from the gates up for a dual-port register file with four 8-bit registers implemented using D-latches. You can draw one gate-level version of the D-latch, and then re-use it as a block. The same goes for other repeated gate-level structures, such as a register, decoder, or multiplexor.
- ii. Calculate the number of AND, OR, NOT, and tristate buffers.

Submission Instructions (read carefully)

Create a single PDF file that contains all your answers, and name it your HowardU username plus .pdf, for example my submission would be named gedare.bloom.pdf
Check your conversion for any errors!

Submit the PDF file under the Homework1 assignment on BlackBoard.