

Name: _____

Computer Science 352
Fall 2016 Midterm

Doodle here.

This is a closed-book, no-calculator, no-electronic-devices, individual-effort exam. You may reference one page of handwritten notes.

2. *Zero and Ones*

Design a circuit called **Minority** with inputs A, B, and C. Its single output voltage is high when no more than one of the inputs is high, including when all three are low. Otherwise, its output is low.

(a) Enumerate all possible inputs and their corresponding outputs for **Minority** in a truth table.

(b) Construct a Karnaugh map for **Minority**, labeling each circled group of minterms with an identifying expression.

(c) Write the minimal logical expression constructed with the aid of your Karnaugh map.

3. *Menos Que*

Write using the HDL syntax of your book a chip named `LessThan`. It accepts as input two 16-bit values named `a` and `b`. It outputs a single bit named `out`, which is 1 if $a < b$ and 0 otherwise. Assume you have at your disposal only chips assigned by your textbook, but not ALU.

This question ended up being more difficult than I intended and was not graded.

4. *Deuce Hardware*

Describe briefly how you'd design the following hardware, including the user interface and the fundamental hardware components that are required to implement it (and that we have discussed).

(a) A device that allows one mouse to operate several different computers, one at a time, without unplugging any cables.

(b) A bird-watching device that let you count sightings of up to four different species of birds.

(c) An attachment for a television marketed toward couples, which powers the television on only when activated by both parties.

(d) A bicycle that rings its bell once every minute that no one is riding it. It gets lonely.

5. *Most Children Left Behind*

You've been appointed by the next president as Senior Advisor for the president's Right Way to Computer Science initiative. You are sitting around a table with your fellow committee members, outlining a universal computer science curriculum that schools will adopt. Someone asks, "What about low-level hardware stuff? Do people need that? And if so, when?" How do you respond? Justify your answer. Argue one side or both.