CE1: Hands-On Computer Engineering

Research Problems 2

0. (optional) attend a SWE meeting on a Tuesday at 6:30pm in BE318. Or, you could go to any other SOE student group meeting such as IEEE or SHPE.

1. Make a list of all the things in your room or apartment that most likely have a computer of some kind in them. How many did come up with?

2. A TTL NAND gate has about 5 transistors, so each 74LS00 has about 20 transistors. What does VLSI stand for? How many transistors does a Core 2 Duo Processor have? Can you figure out what processor is in one of your computers or embedded systems & find something out about it?

3. What does a transistor do? You may wish to focus on the CMOS transistor (what is CMOS?). Use your own words and be very general! (This isn’t EE70!)

4. Truth tables. Consider the problem of using simple logic gates create a circuit for a three-input majority function. That is, one whose output is "true" (or, for the purposes of this class, “hi”, “1”, “5v”, “Vcc”, or “red”) whenever at least two of the inputs are "true". The first step of designing this circuit to create a “truth table” of the eight possible input combinations and the single output for each of the eight combinations. Make up such a table. Be sure to put your rows in proper order from 000 to 111. In class, we will discuss how to convert a truth table into a digital circuit, and then build a three-input majority function.

5. (Extra) Try converting the truth table to digital logic on your own. This will require some research into digital logic gates (AND, OR, NAND, NOR, NOT, etc), as well as how to join them together. Look up ‘Sum of Products’ on the web with one of your classmates to read about one way to convert truth tables to circuits (Bob Brown’s tutorial on designing combinatorial circuits looks good).

6. (Extra) Can you make a smaller circuit?