

**ECE/CS 552: Introduction to Computer Architecture**  
**ASSIGNMENT #2**

**Due Date: In class October 5<sup>th</sup>, 2005**

This homework is to be done individually.

Total 3 Questions, 75 points

**General Instructions:**

All gates must have four or fewer inputs. Set the **RISE and FALL** of each gate in the design equal to **(#of inputs) ns**. Delays of an inverter, "buf.3so", "buf", "buf.3so.n", "buf.n" are 2ns. You can change a component delay by placing the mouse pointer on the current/default delay value and typing **shift F7**. **Note:** To simulate your design with the new delays you must use the **timing\_mode typ** option when starting QuickSim II. Otherwise the delays won't take effect in the simulation.

For example:

sun-xx% **quicksim -timing\_mode typ** design\_name

**1. (15 points - 3 points each)**

For the following computations, assume 8-bit signed 2's complement **with overflow detection** (when this occurs, note it). Please show your work:

- What is the binary representation of  $6 + 13$ ?
- What is the binary representation of  $-6 + 13$ ?
- What is the binary representation of  $-6 + -13$ ?
- What is the binary representation of  $80 + 70$ ?
- What is the binary representation of  $-80 + -70$ ?

**2. (25 points) Mentor Graphics Design and Simulation**

Using Mentor Graphics, design a 4-bit Carry Look Ahead Adder with overflow detection.

**You should turn in the following:**

- A Design Architect Schematic of your CLA Adder.
- A QuickSim II Force File used to test your CLA Adder.
- An output from the list window showing simulation results corresponding to your force file. **On one page**, display enough of examples to show that your unit is functioning

**3. (35 points) Mentor Graphics Design and Simulation**

Using your 4-bit CLA, generate a symbol for this design and use it to construct a 16-bit Carry Look Ahead Adder with overflow detection.

**You should turn in the following:**

- A Design Architect Schematic of your 16-bit CLA Adder.
- A QuickSim II Force File used to test your 16-bit CLA Adder.
- An output from the list window showing simulation results corresponding to your force file. **On one-page**, display enough of examples to show that your unit is functioning correctly.