CS 310H Honors Computer Organization and Programming Spring 2008
Professor Fussell Due: Feb. 14, 2008

Assignment #3

Instructions:
The assignment is due on the date shown above. Tips to remember: give the assignments to your TA in the discussion section, remember your name, section number, TA name, and assignment number (5 points). Also, make sure your assignment is neat, stapled, and is entirely **your own work.**

1. We showed in class that the AND, OR, and NOT gates are logically complete, meaning that together they can implement any logical function.
   (a.) Prove that NAND is a universal logic gate.
   (b.) Prove that NOR is a universal logic gate.
   (c.) Is XOR a universal logic gate? Why or why not.
2. Given the following logic equation:
   $F = A'B'C' + D'(AB' + A'B'C) + D((A + B')(A' + C)(A' + B' + C'))'$:
   (a.) Simplify the equation for F using the axioms of Boolean algebra. Try to reduce to the simplest sum-of-products form. Check your work using Karnaugh maps (i.e. show the Karnaugh map).
   (b.) Write the truth table for your simplified version of F.
   (c.) Draw a gate-level implementation (using only NANDs and inverters) for your simplified equation F.
   (d.) Draw a transistor level implementation of a single complex gate that corresponds to the minimized logic funtion from (a).
   (e.) What is the difference in number of transistors between (c) and (d) above?
3. P&P 3.15
4. P&P 3.23
5. P&P 3.24b
6. P&P 3.25
7. P&P 3.26
8. P&P 3.28
9. P&P 3.30
10. P&P 3.34