Northwestern University
Electrical and Computer Engineering
ECE303: Advanced Logic Design, Spring 02
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May 9, 2002
Handout #7
Due: May 16

Homework 3

You may discuss the assignments with your classmates but need to write down your solutions independently. Be careful with your handwriting. Unclear solutions will be assumed wrong.

1. (20 pts) Katz 3.13 on page 156.

2. (20 pts) Given the following specification of Boolean functions, implement them in a hazard-free manner in the original SOP or POS format:

   (a) $F(A, B, C) = B\bar{C} + \bar{A}C$

   (b) $F(A, B, C, D) = \sum m(0, 4, 5, 6, 7, 9, 11, 13, 14)$

   (c) $F(A, B, C) = (A + B)(\bar{B} + C)$

   (d) $F(A, B, C, D) = \prod M(0, 1, 3, 5, 7, 8, 9, 13, 15)$

3. (20 pts) (Katz 6.5) How would you implement a negative edge-triggered D flip-flop using NAND gates only? What changes are necessary to make this a positive edge-triggered device?

4. (20 pts) Katz 6.13 on page 324.

5. (20 pts) (Katz 7.5) A LIFO (last in, first out) stack is similar in concept to the FIFO queue, except that the most recently pushed data is the first to be popped. The block diagram is identical to the FIFO, except that the data inputs and outputs are the same lines. Design a 4 word by 4 bit LIFO stack using shift registers and combinational logic only. Draw your schematic, indicating the components used. How do you distinguish between a full stack and an empty stack in this implementation?