

CSE352 Autumn 2013 Homework #1

Instructor: Mark Oskin

TAs: Vincent Lee, Mark Wyse

Due In Class Friday 10/11/2013

Please write your name and student ID at the top right corner of each page, and staple or paperclip your work together. We are NOT responsible for losing papers that were not stapled or paperclipped together.

Complete the following questions. Please write legibly and try to draw clean diagrams. Spaghetti wiring in circuit diagrams is difficult to grade. We will not grade work that is too heavily encrypted for us to read (i.e. we can't read it, we can't grade it). Please consider typesetting your work if you think that it may not be legible to the grader. You are encouraged to collaborate with your peers but you must turn in your own work. Justice will be enforced if you are caught cheating.

Problem 1 *Warm Up*

Consider the following Boolean expressions. For each expression write out the corresponding truth table.

(a) $\overline{(\overline{A} + \overline{B})}$

(b) $(A\overline{B} + \overline{A}B)C$

Problem 2 *Boolean Algebra*

Ben Bitdiddle and Alyssa P. Hacker are having an argument over the equivalence of two Boolean expressions (they have nothing better to do). Alyssa P. Hacker claims that the following two expressions are equivalent:

$$AB + B\overline{C} \stackrel{?}{=} \overline{(\overline{A}(\overline{B} + C))}B$$

Ben Bitdiddle on the other hand disagrees and claims that they are not. Who is right? If they are equivalent, prove it using Boolean algebra. If they are not, evaluate the truth table to show that they are not equivalent.

Problem 3 *CMOS Circuits*

For the following Boolean expressions draw the equivalent CMOS gate implementation. Clearly mark the input and output signals and do not assume you have the complements of any signals. Minimize the number of CMOS transistors used in your implementation.

(a) \overline{ABC}

(b) $A + B + C$

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

Problem 4 *Bonus Question (Optional)*

Draw your interpretation of a NYAN gate (<http://www.youtube.com/watch?v=QH2-TGULwu4>) . Clearly label the inputs and outputs, and include a truth table.