Solution for Problem Set #1: Digital Logic and Algorithms

IDST-010-06

Due: Friday, 30 September 2016, 11:59 PM

Instructions. To solve the following problems on digital logic and algorithms, you can work on your own, seek help from me during office hours, or ask questions during class or using the discussion board. You can also consult inanimate outside sources, but you must acknowledge the use of these sources on all versions of your solution. You can not give other students answers, but you can point them in the right direction in class or on the discussion board so everyone can benefit from your advice. Show all of your work, even for solutions that seem trivial or obvious. Feel free to submit a hand-written solution. For electronic submissions, upload a PDF version to Blackboard. Please do not submit electronically by scanning or taking pictures of hand-written solutions.

1. Convert the following decimal numbers into their binary equivalents.

   a) 14 b) 17 c) 34

2. Convert the following binary numbers into their decimal equivalents.

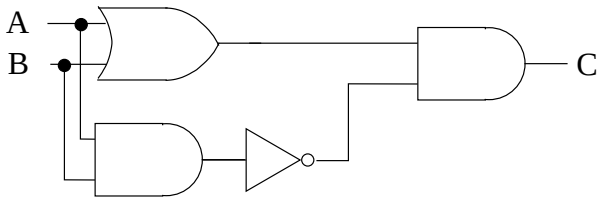
   a) 00010011 b) 10001001 c) 01010100

3. Use only NAND to realize AND, OR, and NOT.

4. Add the following pairs of binary numbers, showing any carry bits.

   a) 010 001
   b) 00011011 10000001
   c) 10101010 00111000
   d) 000111000 011111111

5. Write the truth table for the following circuit. Show the intermediate results for the internal gates.



6. Hoya Pizza sells a 9" square pizza with one topping for $9.99, and Saxa Pizza sells an 10" round pizza with one topping for $8.99. Which is the better buy? Write the numeric solution, an algebraic solution, and an algorithmic solution.

7. Without using the AND function, write an algorithm for an n-input AND function that outputs TRUE when the function is true and outputs FALSE otherwise.

8. Without using the OR function, write an algorithm for an n-input OR function that outputs TRUE when the function is true and outputs FALSE otherwise.