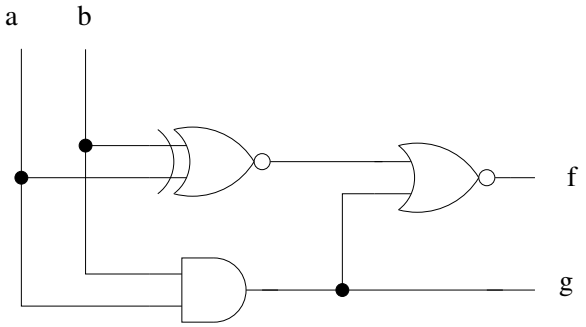
EE 231 – Homework 2
Due September 10, 2010

1. Convert the decimal numbers +75 and +32 to 8-bit hexadecimal numbers, unsing the signed 2's complement representation. Then perform the following operations: (a) $(+75) + (-32)$, (b) $(-75) + (+32)$, (c) $(-75) + (-32)$. Convert the answers back to decimal and verify that they are correct.

2. Convert the following binary numbers to ASCII code:
1001110 1100101 1110111 0100000 1001101 1100101 1111000 1101001
1100011 1101111 0100000 1011000 1100101 1100011 1101000

3. By means of a timing diagram similar to Figure 1.5, show the signals of the outputs f and g in the figure below as functions of the two inputs a and b. Use all four possible combinations of a and b.



4. Use Boolean algebra to prove that the following Boolean equalities are true:
   (a) $a'b' + ab' + a'b = a' + b'$
   (b) $abc + bc' = b(a + c')$
   (c) $(a + b)'bc = 0$
   (d) $(ab' + a'b)' = a'b' + ab$
   (e) $[(a + b(c + a')]' = a'b'$

5. Simplify the following Boolean expressions to a minumum number of operators
   (a) $[(a' + bc')d']'$
   (b) $\{(ab + c)[(ab)' + c']\}'$
   (c) $(x + y)'(x' + y')'$
   (d) $abc' + a'bc' + a'b'c'$

6. Draw logic diagrams of the circuits that implement the original and simplified expressions in Problem 5 (c) and (d)

7. Find the complements of the following expressions:
   (a) $(x + y')(x' + y)$
   (b) $(A'B + CD)E + E'$
   (c) $(x' + y' + z)(x + y)(x + z')$