Homework #3 Due October 3, 2007

5.1 Determine the decimal values of the following unsigned numbers:
(a) $(0111011110)_2$
(b) $(1011100111)_2$
(c) $(3751)_8$
(d) $(A25F)_{16}$
(e) $(F0F0)_{16}$

5.3 Determine the decimal values of the following 2's complement numbers:
(a) 0111011110
(b) 1011100111
(c) 1111111110

5.5 Perform the following operations involving eight-bit 2's complement numbers and indicate whether arithmetic overflow occurs. Check your answers by converting to decimal sign-and-magnitude representation.

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  00110110        01110101       11011111
+01000101       +11011110      +10111000
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  00110110        01110101       11011111
- 00101011       -11010110      -11101100
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5.7 Show that the circuit in Fig. 5.5 implements the full-adder specified in Fig. 5.4a.

5.10 In section 5.5.4 we stated that a carry-out signal, c_k, from bit position k-1 of an adder circuit can be generated as $c_k = x_k \oplus y_k \oplus s_k$, where x_k and y_k are inputs and s_k is the sum bit. Verify the correctness of this statement.

5.14 In Fig. 5.18 we presented the structure of a hierarchical carry-lookahead adder. Show the complete circuit for a four-bit version of this adder, built using 2 two-bit blocks.

5.22 Suppose that we want to determine how many of the bits in a six-bit unsigned number are equal to 1. Design the simplest circuit that can accomplish this task.

5.24 Show a graphical interpretation of three-digit decimal numbers, similar to Fig. 5.12. The left-most digit is 0 for positive numbers and 9 for negative numbers. Verify the validity of your answer by trying a few examples of addition and subtraction.

5.27 consider the subtractions 26-27=99 and 18-34=84. Using the concepts presented in section 5.3.4, explain how these answers (99 and 84) can be interpreted as the correct signed results of these subtractions.