EE 2720, Fall 2011

Homework #2

Due Monday September 26, 2011, in class

Note: Don't do problem 5

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Note: Please STAPLE your homework.

Problem 1: Using the two's-complement system perform the addition of the 6-bit numbers X and Y where $X = 011001_2 = +25_{10}$ and $Y = 011011_2 = +27_{10}$. Do you have an overflow or underflow in this case? Justify your answer.

Problem 2: Using the two's-complement system perform the addition of the 6-bit numbers X and Y where $X = 101100_2 = -20_{10}$ and $Y = 110001_2 = -15_{10}$. Do you have an overflow or underflow in this case? Justify your answer.

Problem 3: Perform the addition X+Y where X and Y are the following 6-bit signed-magnitude numbers: $X = 010101_2 = +21_{10}$ and $Y = 111111_2 = -31_{10}$. Follow the same procedure

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Problem 3 cont. as the one of the example on pages 23-24 of handout # 3

Problem 4: Perform the unsigned binary multiplication with multiplicand $X = 1100_2 = 12_{10}$ and multiplier $Y = 1111_2 = 15_{10}$.

Problem 5: Perform the signed two's-complement binary multiplication with multiplicand $X = 1001_2 = -7_{10}$ and multiplier $Y = 1010_2 = -6_{10}$ } don't do prob. 5

Problem 6: Perform ~~[illegible]~~ in BCD the addition 8 + 7.

Problem 7: Perform in BCD the addition 3+4.

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Problem 8: Prove theorems (T1'), (T2'), (T3), (T3'), (T4), (T5') found in handout # 5.

Problem 9: Prove theorem (T7) of handout # 5 by using a truth table.

Problem 10: Prove theorem (T10') of handout # 5. You are not allowed to use a truth table.

Problem 11: Prove theorem (T13') of handout # 5 using the finite induction technique.

Problem 12: Prove the theorem that states $(X+Y)\cdot(X'+Z) = X\cdot Z + X'\cdot Y$. You are not allowed to use a truth table. **Hint:** Use theorem (T11).

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Problem 13: Prove that theorem (T10) is a special case of theorem (T11). Look at handout #5 for theorems (T10), (T11).

Problem 14: Use the theorems of switching algebra to simplify the following:

(a) $F = W \cdot X \cdot Y \cdot Z \cdot (W \cdot X \cdot Y \cdot Z' + W \cdot X' \cdot Y \cdot Z + W' \cdot X \cdot Y \cdot Z + W \cdot X \cdot Y' \cdot Z)$

(b) $F = A \cdot B + A \cdot B \cdot C' \cdot D + A \cdot B \cdot D \cdot E' + A \cdot B \cdot C' \cdot E + C' \cdot D \cdot E$