Switching Circuits & Logic Design, Fall 2009

Quiz # 1

Problem 1:

Subtract the following pairs of 4-bit binary numbers. Assume that negative numbers are represented in 2's complement. Indicate when an overflow occurs.

$0011 - 1011$ (20 points)

Problem 2:

Find the minimum product-of-sum form of $Z = (AB \oplus C) + (EF \equiv GH)$.

(20 points)

Problem 3:

Simplify $F = ABC'D + A'BE + ABCE + AB'C'D + ABDE$

(reduce to a sum of three terms) $AC'D + A'BE + ABCE$.   (20 points)

Problem 4:

(a) Please draw the Karnaugh map of $F(A,B,C,D) = \Sigma\, m(0, 1, 3, 9, 11, 12, 14, 15) + \Sigma$

don't care $d(4, 5, 6, 7, 10)$. Please note that A is the most significant bit and D is the least significant bit. That means: $ABCD = 0001$ corresponds to the minterm m_1. (10 points)

sum of product

(b) Please show the minimum SOP of F. (10 points) $A'C' + AC + B'D + ABD'$

(c) Please show the minimum POS of F'. (10 points)

(d) Show the maxterm expansion of F'. (10 points) $\Pi M\,(0,1,3,9,11,12,14,15) \cdot \Pi D\,(4,5,6,7,10)$