Switching Circuits & Logic Design, Fall 2011

Quiz # 1

Problem 1: (40 points)

(A) Please provide the *dual* of the following function in a minimum sum-of-products form:

$f(A, B, C) = [A + (BC)'][A' + B(C' + A)]$. (20 points)

(B) Please simplify the following equation using law/theorem(s) of Boolean algebra:

$A'B' + ABC + B'CD + ABD' + ACD$. (20 points)

Problem 2: (35 points)

(A) What is the result of the operation: $1 \oplus 1 \oplus 1 \oplus 1 \oplus 1 \oplus 1 \oplus 1 \oplus 1 \oplus 1 \oplus 1$? (Please provide your reasoning to receive the credits.) (10 points)

(B) Convert the unsigned binary number, 1110101100111.0111_2, to an unsigned base 8 number. (10 points)

(C) If the maximum length of the fractional part is only 8-bit long in a calculator, what is the error generated when converting 3.1416_{10} to binary? (15 points)

Problem 3: (25 points)

(A) Please draw the Karnaugh map of

$F(D, C, B, A) = \Sigma\, m(0, 2, 3, 4, 7, 8, 10) + \Sigma\, d(5, 12, 13, 15)$.

Please note that A is the least significant bit and D is the most significant bit. That means, $D'C'B'A$ corresponds to minterm m_1 while $DC'B'A'$ corresponds to minterm m_8. (15 points)

(B) Please show all essential prime implicants of F. (10 points)