디지털 공학 (MEC520)
Midterm Examination

1. Perform the following subtraction using the 2's compliment after converting the decimal numbers to binary numbers. (8 pt)

    $$36 - 63.6875$$

2. Reduce the following Boolean expression to the indicated number of literals. (8 pt each)
    a) $(x'y' + z)' + z + xy + wz$ to three literals
    b) $A'B(D' + C'D) + B(A + A'CD)$ to one literal

3. Find the possible combinations of the essential prime implicants of the following Boolean functions. (8 pt each)
    a) $F(w, x, y, z) = \Sigma(0,2,4,5,6,7,8,10,13,15)$
    b) $F(A, B, C, D) = \Sigma(1,3,4,5,9,10,11,12,13,14,15)$

4. Simplify the following functions in product of sums. (8 pt each)
    a) $F(w, x, y, z) = \Sigma(0,2,5,7,8,10)$
    b) $F(A, B, C, D) = \Pi(1,3,5,7,13,15)$
    c) $F(x, y, z) = x'z' + y'z' + yz' + xy$ (Use only K-map, do not use algebraic manipulation)

5. Simplify the following Boolean Function F, together with the don't care conditions d, and then express the simplified function in sum of minterms. (8 pt each)

    a)
    $$F(A, B, C, D) = \Sigma(0,6,8,13,14)$$
    $$d(A, B, C, D) = \Sigma(2,4,10)$$

    b)
    $$F(A, B, C, D) = \Sigma(1,3,5,7,9,15)$$
    $$d(A, B, C, D) = \Sigma(4,6,12,13)$$

6. Draw a logic diagram using only two-input NAND gates to implement the following expression. (12 pt)

    $$(AB + A'B')(CD' + C'D)$$

7. Implement the following Boolean expression with exclusive-OR and AND gates. (8 pt)

    $$F = AB'CD' + A'BCD' + AB'C'D + A'BC'D$$

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학번_____   이름_____