

Assignment 1 Boolean Algebra

1. Simplify the following Boolean functions to minimum number of literals (input variables).

(a) $F = ABC + ABD + \overline{A}B\overline{C} + CD + B\overline{D}$

(b) $F = A \cdot (A + B + C) \cdot (\overline{A} + B + C) \cdot (A + \overline{B} + C) \cdot (A + B + \overline{C})$

(Hint: Double complements and DeMorgan's theorem for multiple variables are needed to accomplish part (b).)

2. Prove the following identities algebraically

(a) $\overline{A}D + \overline{C}D + \overline{A}\overline{B} = \overline{A}\overline{C}D + A\overline{C}D + \overline{A}\overline{B}\overline{C} + \overline{A}\overline{B}C + \overline{A}\overline{C}D$

(b) $B + AC = (A + B + C) \cdot (\overline{A} + B + C) \cdot (\overline{A} + B + \overline{C})$

(Hint: Double complements and DeMorgan's theorem for multiple variables are needed to accomplish part (b).)

3. Given the following Boolean function:

$$F = x \overline{y} z + \overline{x} \overline{y} z + \overline{w} x y + w \overline{x} y + w x y$$

- (a) Obtain the truth table of the function.
 - (b) Draw the logic diagram using the original Boolean expression.
 - (c) Simplify the function to a minimum number of literals using Boolean algebra.
 - (d) Obtain the truth table of the function from the simplified expression and show that it is the same as the one in part (a).
 - (e) Draw the logic diagram from the simplified expression.
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