

Practice problems

Reduce the following Boolean expressions to the indicated number of literals:

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|--------------------------------------|-------------------|
| (a) $A'C' + ABC + AC'$ | to three literals |
| (b) $(x'y' + z)' + z + xy + wz$ | to three literals |
| (c) $A'B(D' + CD) + B(A + A'CD)$ | to one literal |
| (d) $(A' + C)(A' + C')(A + B + C'D)$ | to four literals |
| (e) $ABC'D + A'BD + ABCD$ | to two literals |

Draw the logic diagrams that implement the original and simplified expressions

Practice problems

- List the truth table of the function:
 1. $F = xy + xy' + yz'$
 2. $F = bc + a'c'$
- We can perform logical operations on strings of bits by considering each pair of corresponding bits separately (called bitwise operation). Given two eight-bit strings $A = 10110001$ and $B = 10101100$, evaluate the eight-bit result after the following logical operations:
(a) AND (b) OR (c) XOR (d) NOT A (e) NOT B

Practice problems

Implement the Boolean function

$$F = xy + x'y' + y'z$$

- (a) With AND, OR, and inverter gates
- (b) With OR and inverter gates
- (c) With AND and inverter gates
- (d) With NAND and inverter gates
- (e) With NOR and inverter gates

Practice problems

- Express the following function as a sum of minterms and as a product of maxterms:

$$F(A, B, C, D) = B'D + A'D + BD$$

- Express the complement of the following functions in sum-of-minterms form:

(a) $F(A, B, C, D) = \Sigma(2, 4, 7, 10, 12, 14)$

(b) $F(x, y, z) = \Pi(3, 5, 7)$

- Convert each of the following to the other canonical form:

(a) $F(x, y, z) = \Sigma(1, 3, 5)$

(b) $F(A, B, C, D) = \Pi(3, 5, 8, 11)$

Practice problems

- Convert each of the following expressions into sum of products and product of sums:
 - (a) $(u + xw)(x + u'v)$
 - (b) $x' + x(x + y')(y + z')$
- Draw the logic diagram corresponding to the following Boolean expressions without simplifying them:
 - (a) $BC' + AB + ACD$
 - (b) $(A + B)(C + D)(A' + B + D)$
 - (c) $(AB + A'B')(CD + C'D)$
 - (d) $A + CD + (A + D')(C' + D)$