

1. Minimize the following Boolean functions:

- a. $x y + x y'$
- b. $(x + y) (x + y)'$
- c. $x y z + x' y + x y z'$
- d. $z x + z x' y$
- e. $(A + B)' (A' + B')'$
- f. $y (w z' + w z) + x y$

2. Minimize the following Boolean functions:

- a. $A B C + A' B' C + A' B C + A B C' + A' B' C'$
- b. $B C + A C' + A B + B C D$
- c. $[(C D)' + A]' + A + C D + A B$
- d. $(A + C + D) (A + C + D') (A + C' + D) (A + B')$

3. Find the complement of the following Boolean functions and simplify them:

- a. $(B C' + A' D) (A B' + C D)'$
- b. $[(A B)' A] [(A B)' B]$
- c. $A B' + C' D'$

4. Given the function $F = x y + x y' + y' z$

- a. Obtain the truth table of F
- b. Implement F using AND, OR, and NOT gates
- c. Obtain F'
- d. Express both F and F' in both SoP and PoS canonical forms

5. Simplify the function T_1 and T_2

A	B	C	T ₁	T ₂
0	0	0	1	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	0	1
1	0	1	0	1
1	1	0	0	1
1	1	1	0	1

6. Express the following functions in a sum of minterms:

- a. $F(A, B, C, D) = D (A' + B) + B' D$
- b. $F(w, x, y, z) = y' z + w x y' + w x z' + w' x' z$
- c. $F(A, B, C, D) = (A + B' + C) (A + C' + D') (A' + B + C + D') (B + C' + D')$

7. Express the following functions in a product of maxterms:

- a. $F(A, B, C, D) = (A' + B) (B' + C)$
- b. $F(x, y, z) = 1$
- c. $F(A, B, C) = (A B + C) (B + A C)$

8. Convert the following functions to the other canonical form:

- a. $F(x, y, z) = \sum (1,3,7)$
- b. $F(A, B, C, D) = \sum (0, 2, 6, 11, 13, 14)$
- c. $F(x, y, z) = \prod (0,3,6,7)$
- d. $F(A, B, C, D) = \prod (0, 1, 2, 3, 4, 6, 12)$

9. A majority gate is a digital circuit that its output equal to 1 if the majority of the inputs are 1's. The Output is 0 otherwise. By means of a truth table, find the Boolean function implemented by a 3-input majority gate. Simplify the function.