



Problem set 4 (Boolean Algebra)

Exercise 1:

Question: Trace the Truth Table for the following Boolean Functions:

1. With 2 variables:

$$F(A,B) = AB + A\bar{B}$$

$$F(A,B) = (\overline{A+B}) + A$$

2. With 3 variables:

$$F(A,B,C) = ABC + A\bar{B}C + \bar{A}BC$$

$$F(A,B,C) = (A+B)(A+C)$$

3. With 4 variables:

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

$$F(A,B,C,D) = \bar{A}\bar{B}CD + \bar{A}B\bar{C}D + A\bar{B}\bar{C}D + ABCD$$

Exercise 2:

Question: Drive the Canonical forms SoP and PoS from the following Truth Tables:

1. With 2 variables:

A	B	F
0	0	0
0	1	1
1	0	0
1	1	1

2. With 3 variables:

A	B	C	F
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	0

3. With 4 variables:

A	B	C	D	F
0	0	0	0	0
0	0	0	1	1
0	0	1	0	0
0	0	1	1	0
0	1	0	0	1
0	1	0	1	1
0	1	1	0	1
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	1
1	1	0	0	0
1	1	0	1	1
1	1	1	0	1
1	1	1	1	0

Exercise 3:

Question: Reduce the following Boolean expressions using Algebraic Simplification:

1. $AC + \overline{A}\overline{B}C$
2. $\overline{A}\overline{B} + \overline{A}B\overline{C} + \overline{(A+C)}$
3. $\overline{(A+B+C)}D + AD + B$
4. $AB + (\overline{A+B}) + (A+B)(\overline{A+B})$

Exercise 4:

1). Extract the SoP and PoS from the following Truth Tables, Then use the Karnaugh map using 1s then 0s to minimize the functions:

1. With 3 variables:

A	B	C	F
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	0

2.* With 3 variables:

A	B	C	F
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

3. With 4 variables:

A	B	C	D	F
0	0	0	0	1
0	0	0	1	1
0	0	1	0	0
0	0	1	1	1
0	1	0	0	0
0	1	0	1	0
0	1	1	0	1
0	1	1	1	0
1	0	0	0	1
1	0	0	1	0
1	0	1	0	0
1	0	1	1	1
1	1	0	0	0
1	1	0	1	1
1	1	1	0	1
1	1	1	1	0

4.* With 4 variables:

A	B	C	D	F
0	0	0	0	0
0	0	0	1	0
0	0	1	0	1
0	0	1	1	1
0	1	0	0	1
0	1	0	1	0
0	1	1	0	1
0	1	1	1	0
1	0	0	0	1
1	0	0	1	1
1	0	1	0	0
1	0	1	1	0
1	1	0	0	1
1	1	0	1	0
1	1	1	0	0
1	1	1	1	1

2). Use the Quine-McCluskey method to reduce the previous functions in the Truth Tables.

*) Truth Table 2 and 4 can be skipped for the late groups.