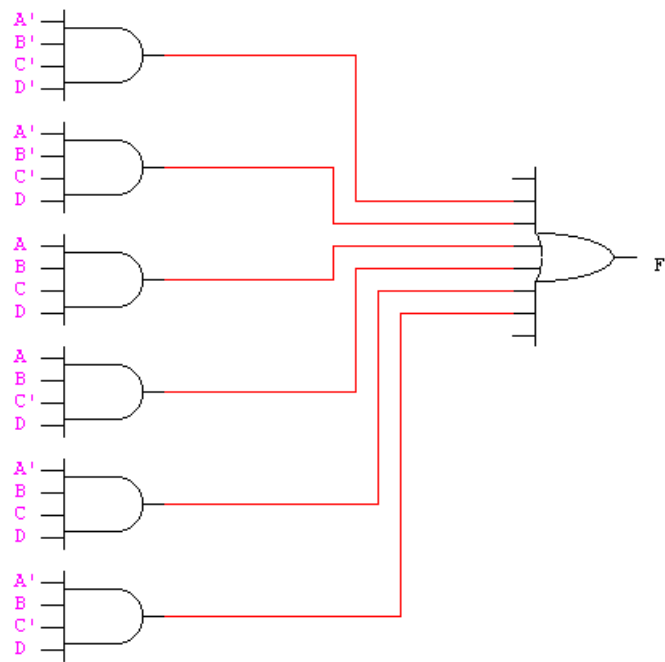


Boolean Functions

$F = A'B'C'D' + A'B'C'D + ABCD + ABC'D + A'BCD + A'BC'D$

A	B	C	D	F	
0	0	0	0	1	A'B'C'D'
0	0	0	1	1	A'B'C'D
0	0	1	0	0	
0	0	1	1	0	
0	1	0	0	0	
0	1	0	1	1	A'BC'D
0	1	1	0	0	
0	1	1	1	1	A'BCD
1	0	0	0	0	
1	0	0	1	0	
1	0	1	0	0	
1	0	1	1	0	
1	1	0	0	0	
1	1	0	1	1	ABC'D
1	1	1	0	0	
1	1	1	1	1	ABCD



Boolean Function Simplification

$$F = A'B'C'D' + A'B'C'D + ABCD + ABC'D + A'BCD + A'BC'D$$

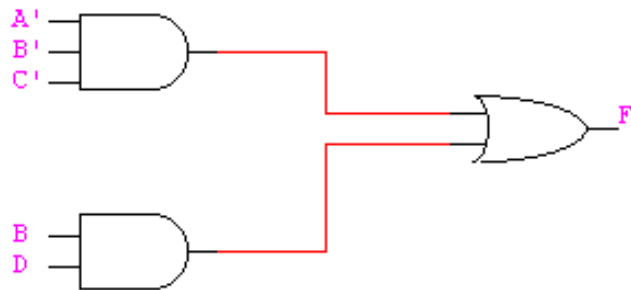
$$= A'B'C'(D' + D) + BDAC + BDAC' + BDA'C + BDA'C'$$

$$= A'B'C' + BD(AC + AC' + A'C + A'C')$$

$$= A'B'C' + BD(A(C+C') + A'(C+C'))$$

$$= A'B'C' + BD(A + A')$$

$$= A'B'C' + BD$$



Karnaugh Maps

Two variable K-map

A\B	B=0	B=1
A=0	0	1
A=1	2	3

Three variable K-map

A\BC	00	01	11	10
00	0	1	3	2
01	4	5	7	6

Four variable K-map

AB\CD	00	01	11	10
00	0	1	3	2
01	4	5	7	6
11	12	13	15	14
10	8	9	11	10

Karnaugh map of sample Boolean Function

$$F = A'B'C'D' + A'B'C'D + ABCD + ABC'D + A'BCD + A'BC'D$$

$$F(A,B,C,D) = \sum (0,1,5,7,13,15)$$

AB\CD	00	01	11	10
00	1	1	0	0
01	0	1	1	0
11	0	1	1	0
10	0	0	0	0

Boolean Function Simplification using K-map

$$(0,1): A'B'C'$$

$$(5,7): A'BD$$

$$(13,15): ABD$$

$$(5,7,13,15): BD$$

$$F = A'B'C' + BD$$

Complement of a function using DeMorgan's theorem

If $F = X_1 + X_2 + X_3 + \dots + X_n$ then

$$F' = X'_1 X'_2 X'_3 \dots X'_n$$

If $F = X_1 X_2 X_3 \dots X_n$ then

$$F' = X'_1 + X'_2 + X'_3 + \dots + X'_n$$

Example:

$$F = A'B'C' + BD$$

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

