

HOMEWORK 6

1) For the following functions simplify using K-Map

$$f(A, B, C, D) = (A + B' + C + D)(A' + B + C')(A' + B + C + D')$$

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

AC'D'

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

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

BC+A

$$F(a, b, c, d) = (a + b + d)(a' + c)(a' + b' + c')(a + b + c' + d')$$

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

B+BC'

$$f' = \prod M(3, 4, 5, 6, 7) = M_3 M_4 M_5 M_6 M_7$$

A\B\C/D	00	01	11	10
00	0	0	1	1
01	0	0	1	1
11	0	0	1	1
10	0	0	1	1

C

$$f(A, B, C) = M_0 M_1 M_2$$

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

A\B\C/D	00	01	11	10
00	1	1	0	0
01	1	1	0	0
11	1	1	0	0
10	1	1	0	0

A+C

$$F_1 = (x + y' + z)(w' + x' + y)(w + x + y')(w' + y + z')$$

Wx \ Yz	00	01	10	11
00	0	1	1	0
01	0	1	1	1
10	1	0	0	0
11	1	0	1	1

WX+Y

$$f(A, B, C) = m_3 + m_4 + m_5 + m_6 + m_7$$

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

AB+C

$$X(A, B, C, D) = \sum m(7, 10, 11, 13, 14, 15)$$

$$Y(A, B, C, D) = \sum m(2, 3, 5, 6, 8, 9, 12, 15)$$

$$Z(A, B, C, D) = \sum m(1, 3, 4, 6, 9, 11, 12, 14)$$

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

X=AC+B

Handwritten Karnaugh map for the function $Y = A + B' + A'B'$. The map is a 4x4 grid with columns labeled 00, 01, 11, 10 and rows labeled 00, 01, 11, 10. The cells contain 0s and 1s. The 1s are located at (00, 00), (01, 00), (11, 00), (10, 00), (00, 01), (01, 01), (11, 01), (10, 01), (00, 11), (01, 11), (11, 11), (10, 11), (00, 10), (01, 10), (11, 10), and (10, 10). The expression $A + B' + A'B'$ is written below the map.

$$Y = A + B' + A'B'$$

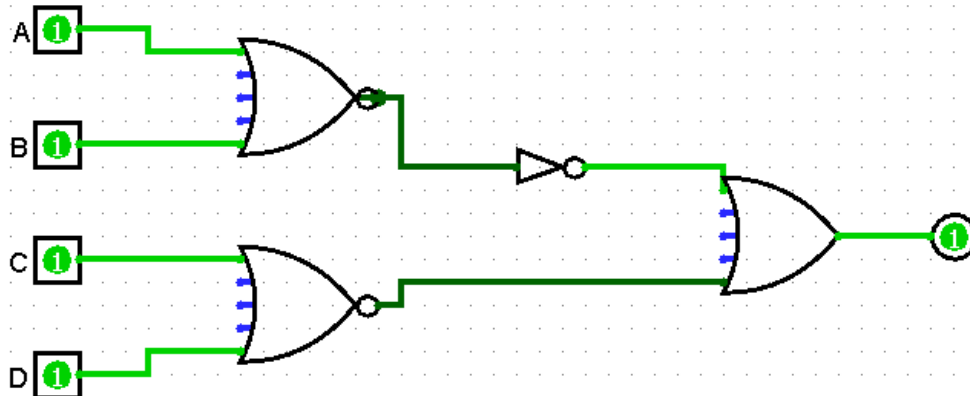
Handwritten Karnaugh map for the function $Z = A + C$. The map is a 4x4 grid with columns labeled 00, 01, 11, 10 and rows labeled 00, 01, 11, 10. The cells contain 0s and 1s. The 1s are located at (00, 00), (01, 00), (11, 00), (10, 00), (00, 01), (01, 01), (11, 01), (10, 01), (00, 11), (01, 11), (11, 11), (10, 11), (00, 10), (01, 10), (11, 10), and (10, 10). The expression $Z = A + C$ is written below the map.

$$Z = A + C$$

2) Derive the Boolean function in a POS form from the following truth table

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

Draw the circuit in Logisim and test the truth table
Simplify the function using KMap.



3) From the following truth table derive the Boolean Expression in a POS from, simplify using K-Map and draw the Logic Diagram that represent the simplified circuit.

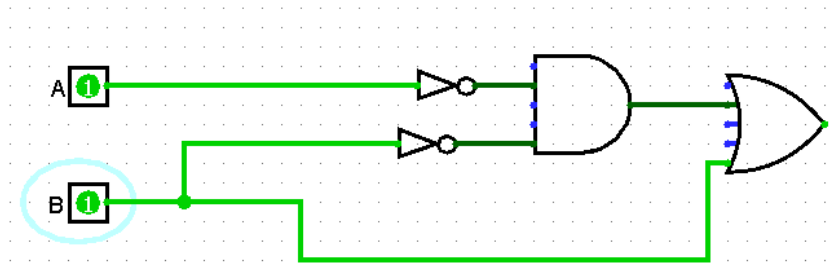
a	b	c	F
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	0

$B + A'B'$

Handwritten K-map and truth table for the function F . The K-map shows the function simplified to $B + A'B'$.

a	b	c	F
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	0

Simplified Boolean Expression: $B + A'B'$



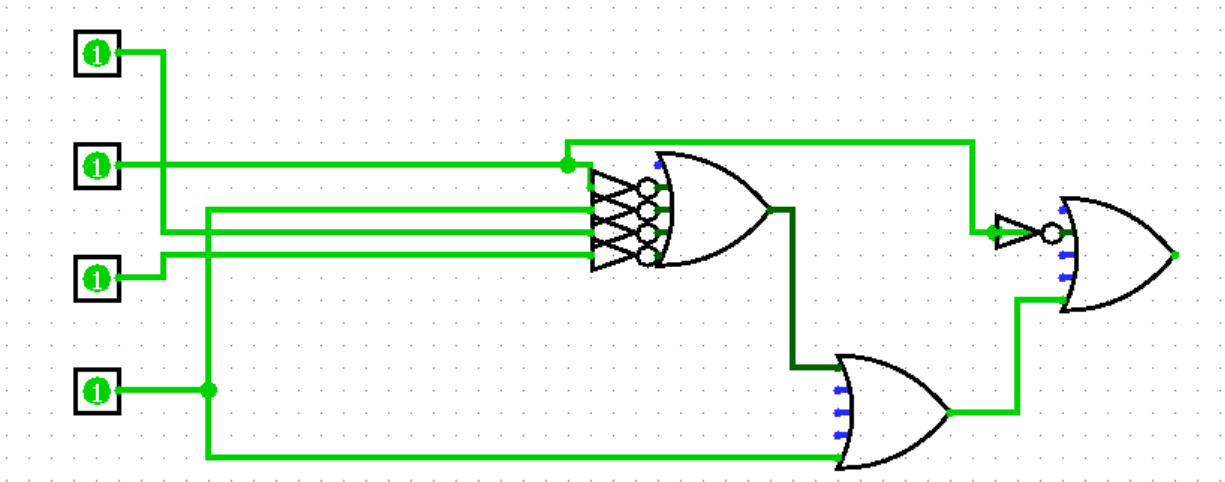
4) From the following truth table derive the Boolean Expression in a POS from, simplify using K-Map and draw the Logic Diagram that represent the simplified circuit.

A	B	C	D	Z
0	0	0	0	1
0	0	0	1	0
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	0
1	0	0	1	1
1	0	1	0	X
1	0	1	1	X
1	1	0	0	X
1	1	0	1	X
1	1	1	0	X
1	1	1	1	X

Q.

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

$A'B'C' (C+D+B+A\bar{C}D)$



5) From the following K-Map derive the simplified Boolean Expression in a SOP and in a POS form. Draw both Logic Diagram that represent the circuits.

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

