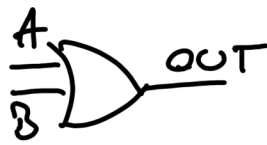


Seminar 3 electronica I:

Sau $A+B$
 "OR"



A	B	OUT
0	0	0
0	1	1
1	0	1
1	1	1

si $A \cdot B$
 "AND"



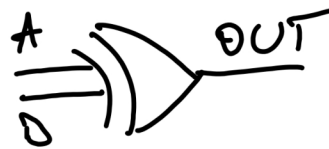
A	B	OUT
0	0	0
0	1	0
1	0	0
1	1	1

inversie
 (negare)
 "NOT"



A	OUT
0	1
1	0

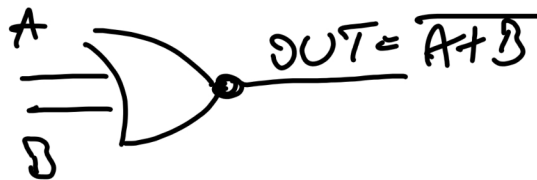
Sau-EXCLUSIU
 EXCLUSIVE OR
 "XOR"



$$A \oplus B = A\bar{B} + \bar{A}B$$

A	B	OUT
0	0	0
0	1	1
1	0	1
1	1	0

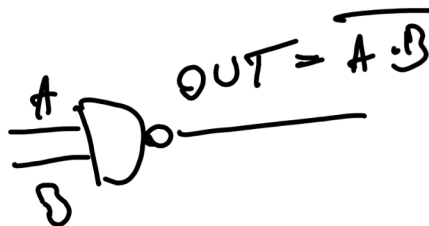
Sau-XU



A	B	OUT
0	0	1
0	1	0
1	0	0
1	1	0

Universale

si-XU



A	B	OUT
0	0	1
0	1	1
1	0	1
1	1	0

Teoremele algebrei Booleene:

$$x \cdot 0 = 0$$

$$x \cdot 1 = x$$

$$x \cdot x = x$$

$$x \cdot \bar{x} = 0$$

$$x + 0 = x$$

$$x + 1 = 1$$

$$x + x = x$$

$$x + \bar{x} = 1$$

$$x + y = y + x$$

$$x \cdot y = y \cdot x$$

$$x + (y + z) = (x + y) + z = x + y + z$$

$$x \cdot (y \cdot z) = (x \cdot y) \cdot z = x \cdot y \cdot z$$

$$x \cdot (y + z) = x \cdot y + x \cdot z$$

$$(w + x)(y + z) = wy + wz + xy + xz$$

$$x + xy = x$$

$$x + \bar{x}y = x + y$$

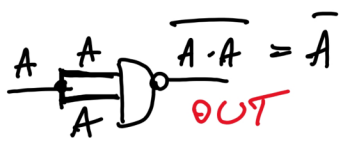
Teoremele lui DeMorgan:

$$\overline{(x + y)} = \bar{x} \cdot \bar{y}$$

$$\overline{(x \cdot y)} = \bar{x} + \bar{y}$$

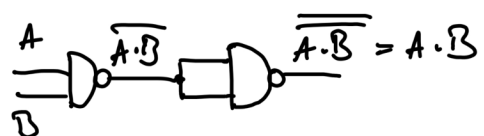
Universalitatea portilor si-NU:

"NOT"

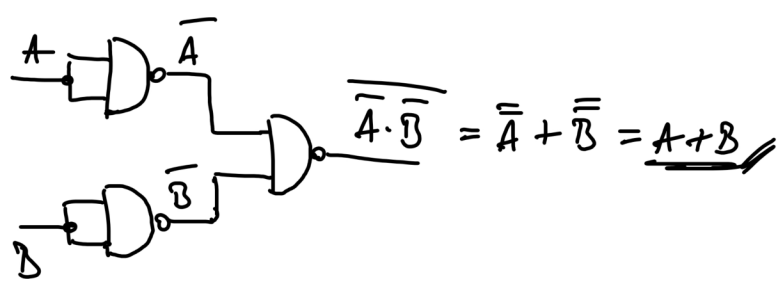


A	OUT
0	1
1	0

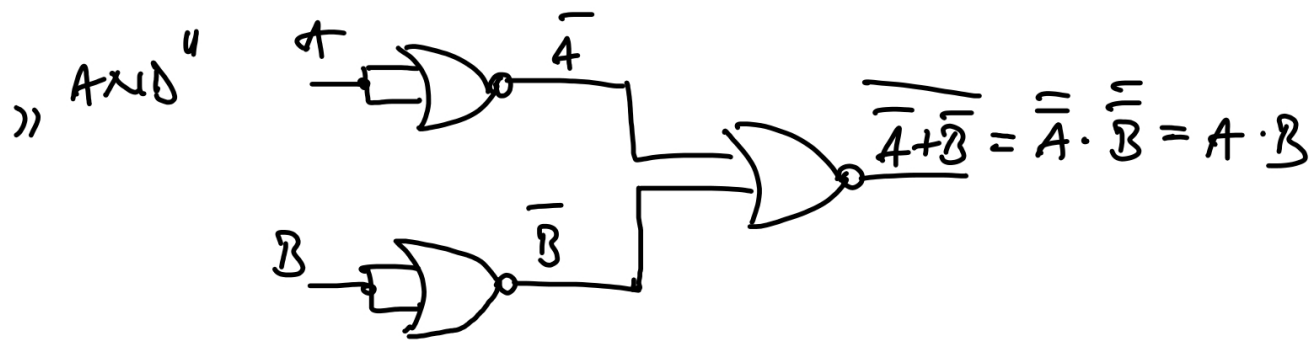
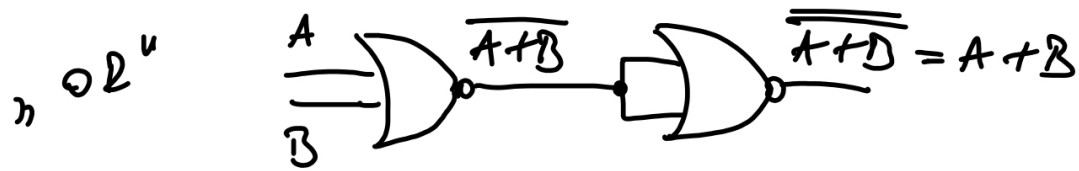
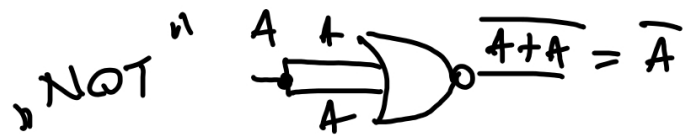
"AND"



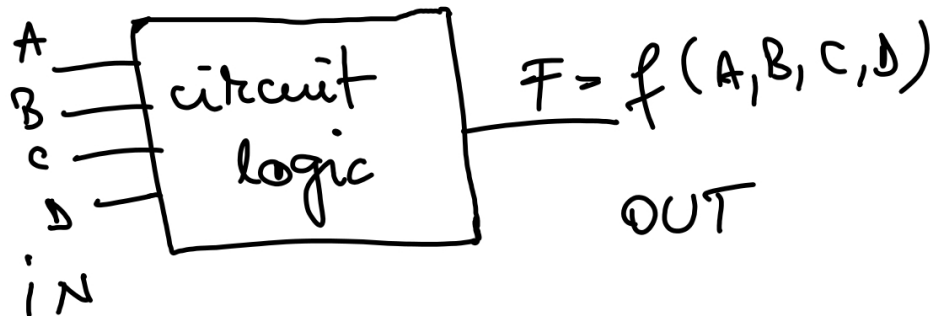
"OR"



Universalitatea portilor SAU-XU:



Minimizarea funcțiilor logice:



1. Minimizare folosind algebra Booleană
2. Minimizare folosind metode grafice (Karnaugh, SOP, POS).

ex. 1

minimizati functia $\overline{A\overline{B}} + C = \overline{F}$

3x NOT
2x AND
1x OR

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

$\overline{C} (\overline{A} + \overline{\overline{B}})$

2x NOT
1x AND
2x OR

Varianta 1:

Tabloul de adevar

$$F = \overline{A\overline{B}} + C$$

	A	B	C	F
0	0	0	0	1
1	0	0	1	0
2	0	1	0	1
3	0	1	1	0
4	1	0	0	0
5	1	0	1	0
6	1	1	0	1
7	1	1	1	0

miniterms

maxterms

F = sum of products = SOP

$$F = \sum m_i = m_0 + m_2 + m_6$$

$$m_0 = \overline{A}\overline{B}\overline{C}$$

$$m_2 = \overline{A}B\overline{C}$$

$$m_6 = A\overline{B}\overline{C}$$

$$F = \overline{A}\overline{B}\overline{C} + \overline{A}B\overline{C} + A\overline{B}\overline{C}$$

Varianta 2:

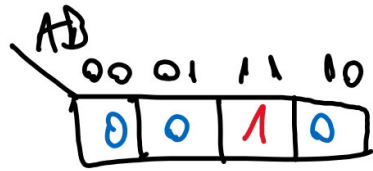
F = product of sums = POS

$$F = \prod M_i = M_1 \cdot M_3 \cdot M_4 \cdot M_5 \cdot M_7 =$$

$$= (A+B+\overline{C}) \cdot (A+\overline{B}+\overline{C}) \cdot (\overline{A}+B+C) \cdot (\overline{A}+\overline{B}+\overline{C}) \cdot (\overline{A}+\overline{B}+C)$$

Minimizarea folosind diagrame Karnaugh.

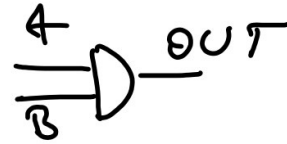
2 variabile



mintezens

$$OUT = AB$$

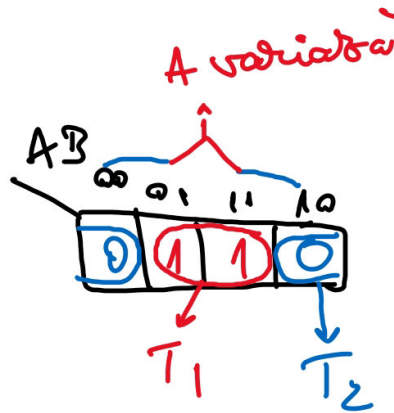
ex:



A	B	OUT
0	0	0
0	1	0
1	0	0
1	1	1

exemplu alternativ:

A	B	Y
0	0	0
0	1	1
1	0	0
1	1	1



$$T_1 = B$$

$$Y = B$$

$$T_2 = B$$

$$Y = \bar{A}B + AB = B(\bar{A} + A) = B \cdot 1 = B$$

$$Y = (A + B)(\bar{A} + B) = \underbrace{A\bar{A}}_0 + AB + \bar{A}B + BB - \underbrace{B(A + \bar{A})}_1 + B = B + B + B - B = B$$

Y → SOP → NAND

Y → POS → NOR

grupări de 2, 4, 8 termeni

2 termeni

- elimină 1 var.

4 termeni

- elimină 2 var.

8 termeni 3 var.

Diagramme Karnaugh cu 3 variabile

		AB			
C		00	01	11	10
0					
1					

exercitiu

A	B	C	Y
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	0

minimizati functia Y:

		AB			
C		00	01	11	10
0		0	0	0	1
1		1	1	0	1

$T_1 = C\bar{A}$

$T_2 = A\bar{B}$

$$Y \rightarrow \text{SOP} \Rightarrow Y = T_1 + T_2$$

$$Y = C\bar{A} + A\bar{B}$$