

bus 3 portate logică

Functii logice

$$f: 2^n \rightarrow 2^1$$

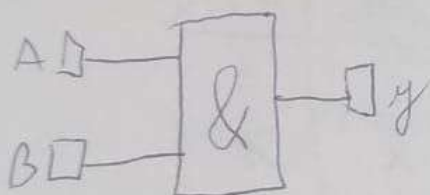
$$f(A, B, C, D) \rightarrow Y$$

($\forall A, B, C, D$ biti sau valori booleene)

Algebra booleană

Porta AND

$$Y = A \cdot B \text{ (înmulțire)}$$



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

Proprietăți

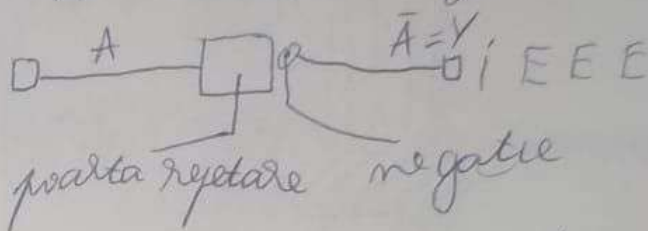
$$\begin{cases} A \cdot 0 = 0 \\ A \cdot 1 = A \end{cases}$$

Operații Fundamentale

①

NOT

\bar{A} inversare algebrică



A	\bar{A}
0	1
1	0

Tablă de adevăr

Porta SAU

$$Y = A + B \text{ (adunare)}$$



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

Proprietăți

$$A + 0 = A$$

$$A + 1 = 1$$

③

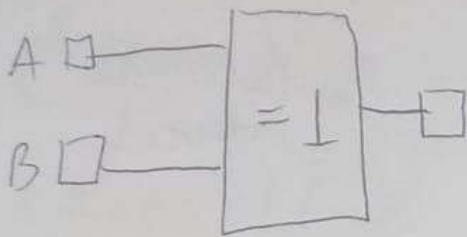
①, ②, ③

s.n. fundamentale
se pot fi formate din
porți mai mici

Porte de base

④ Porte XOR; $Y = A \oplus B$

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



Porte NOR

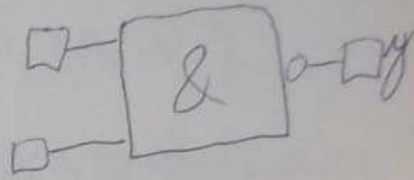
$$Y = \overline{A + B}$$



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

Porte NAND

$$Y = \overline{A \cdot B}$$



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

$$f(A, B) = y = A + BC$$

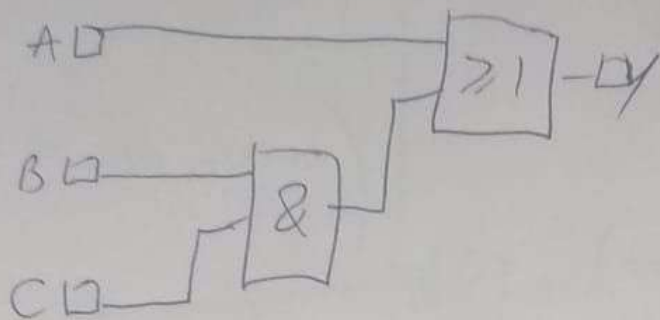
$$g(A, B) = y = (A + B)(A + C)$$

$$g = f(\forall A, B)$$

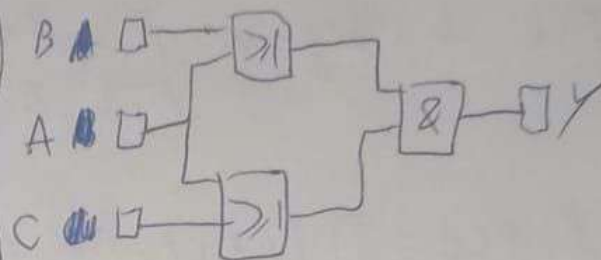
f(A, B)	A	B	C	BC	A + BC
0	0	0	0	0	0
1	0	0	1	0	0
2	0	1	0	0	0
3	0	1	1	1	1
4	1	0	0	0	1
5	1	0	1	0	1
6	1	1	0	0	1
7	1	1	1	1	1

g	A	B	C	A + B	A + C	(A + B)(A + C)
0	0	0	0	0	0	0
1	0	0	1	0	1	0
2	0	1	0	1	0	0
3	0	1	1	1	1	1
4	1	0	0	1	1	1
5	1	0	1	1	1	1
6	1	1	0	1	1	1
7	1	1	1	1	1	1

$$f(A, B, C) = A + BC$$



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



$$\begin{aligned} (A+B)(A+C) &= A \cdot A + A \cdot C + B \cdot A + B \cdot C \\ &= A + AC + AB + BC \end{aligned}$$

$$\begin{aligned} (A+B)(A+C) &= A \cdot A + AC + BA + BC = A + A(C+B) + BC \\ &= A + A(C+B) + BC = A(1+C+B) + BC \\ &= A + BC = f = g \end{aligned}$$

Formele Canonice

a) Forma canonică disjunctivă

Se scrie sub formă de sumă de produse conținând termenii pentru care ieșirea este 1.

$$f: \overline{FCD} = \sum (3, 4, 5, 6, 7) = m(3, 5, 6, 7) =$$

$$= \overline{A}BC + A\overline{B}\overline{C} + A\overline{B}C + A\overline{B}\overline{C} + ABC$$

nr de termeni egali cu numărul de ieșiri
cu valoarea 1 pt funcția dată

$$g: \overline{FCD} = \sum (3, 4, 5, 6, 7) = m(3, 7)$$

$$= \overline{A}BC + A\overline{B}\overline{C} + A\overline{B}C + A\overline{B}\overline{C} + ABC$$

(negi se e 0 direct)
termeni A, B, C

b) Forma canonică disjunctivă

FCC de Morgan $\overline{AB} = \overline{A} + \overline{B}$
 $\overline{A+B} = \overline{A} \cdot \overline{B}$

(inversul fals de FCC)

f: FCC = $\prod(0, 1, 2) = M(0, 1, 2) =$
 $= (A+B+C)(A+B+\overline{C})(A+\overline{B}+C)$

g: FCC = $\prod(0, 1, 2) = M(0, 1, 2) =$
 $= (\overline{A}+B+C)(\overline{A}+B+\overline{C})(\overline{A}+\overline{B}+C)$

$C + AB\overline{C} + AB = C + AB$

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

$C + AB(\overline{C} + 1) = AB + C$

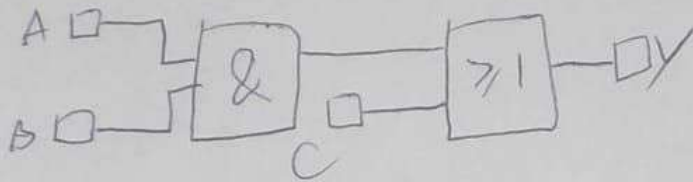
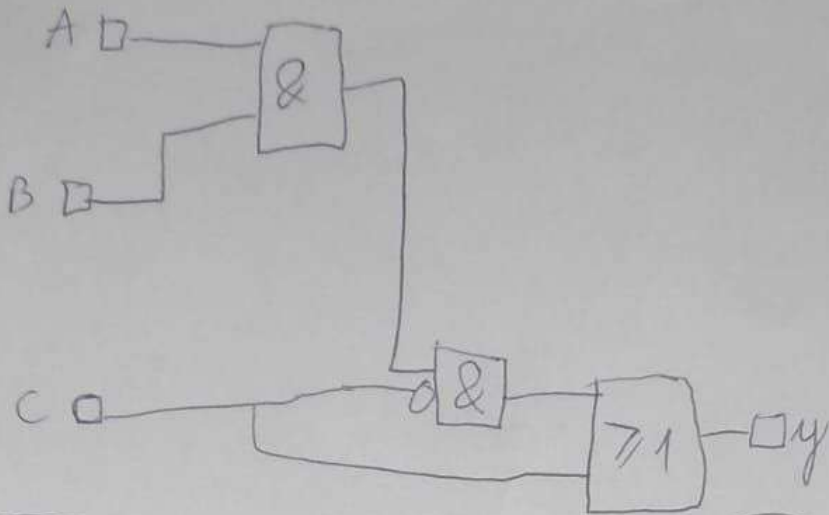
$C + AB \cdot 1 = AB + C \Rightarrow C + AB = AB + C$

1. $A = A$

#	A	B	C	AB	\overline{C}	$AB\overline{C}$	Y
0	0	0	0	0	1	0	0
1	0	0	1	0	0	0	1
2	0	1	0	0	1	0	0
3	0	1	1	0	0	0	1
4	1	0	0	0	1	0	0
5	1	0	1	0	0	0	1
6	1	1	0	1	1	1	1
7	1	1	1	1	0	0	1

~~$\prod(0, 2, 4, 6, 7) = \prod(0, 2, 4)$~~
 ~~$= \overline{A}\overline{B}\overline{C} + A$~~

$\Sigma(1, 3, 5, 6, 7) = \prod(2, 4)$
 $= \overline{A}\overline{B}C + \overline{A}B\overline{C} + A\overline{B}\overline{C} + AB\overline{C} + ABC$
 $= (A+B+C)(A+\overline{B}+C)(\overline{A}+B+C)$



$$\overbrace{A(A+B)}^Y = A$$

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

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

~~Not a law~~

#	A	B	\bar{B}	$A + \bar{B}$	Y
0	0	0	1	1	0
1	0	1	0	0	0
2	1	0	1	1	1
3	1	1	0	1	1

$$\sum(2,3) = A\bar{B} + AB$$

$$\prod(0,1) = (A+B)(A+\bar{B})$$

