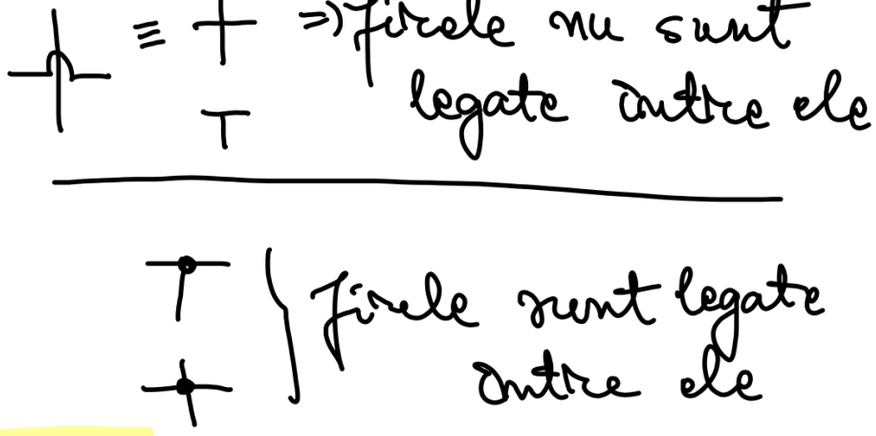
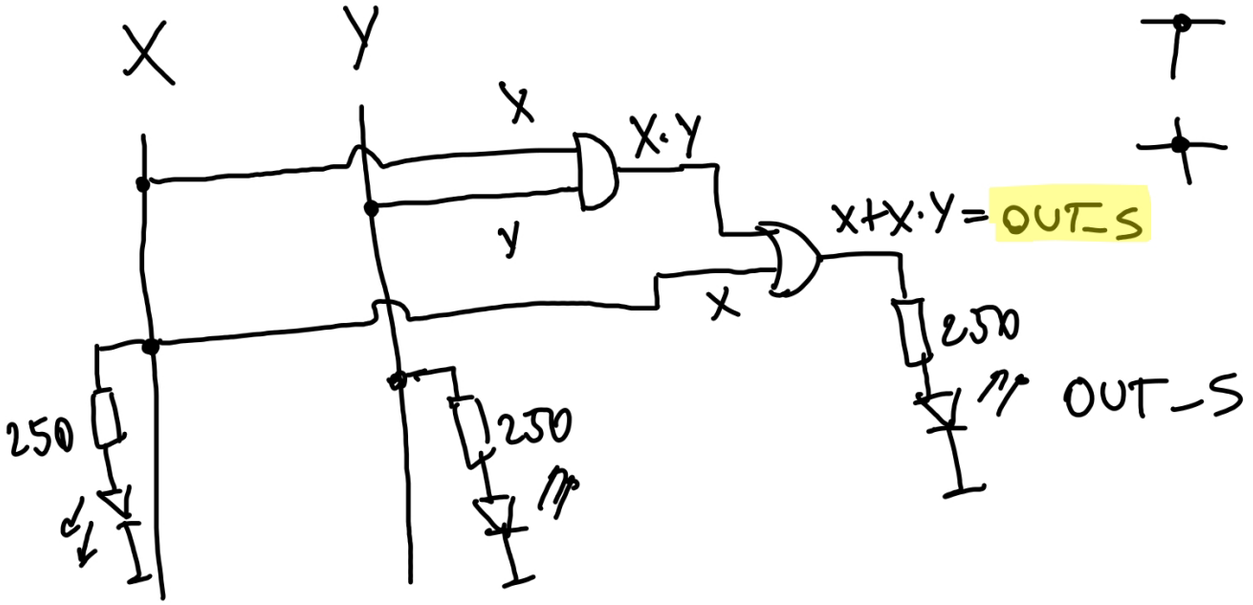
# Laborator nr. 4:

(a) Teorema: $\underbrace{X + X \cdot Y}_{\text{OUT\_S}} = \underbrace{X}_{\text{OUT\_D}}$ → verificare experimentală!

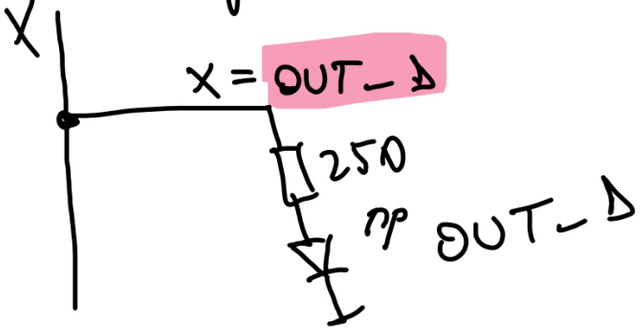
**Pasul 1:** Schemele cu porți.




schema stângă:




schema dreaptă:



Pasul 2: Tabelul de adevăr completat pe baza măsurătorilor!

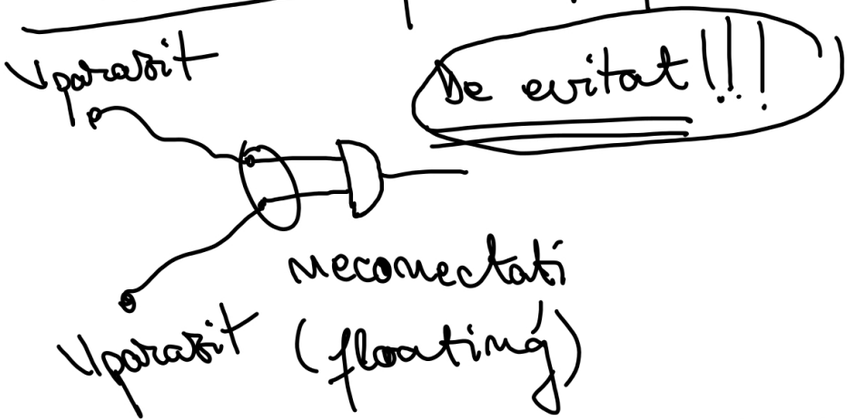
| X | Y | OUT_S | OUT_D |
|---|---|---|---|
| 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 |
| 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 1 |

$\Rightarrow$ OUT_S = OUT_D

$\Downarrow$

Teorema este validă

Rezistori de pull-up / pull-down:

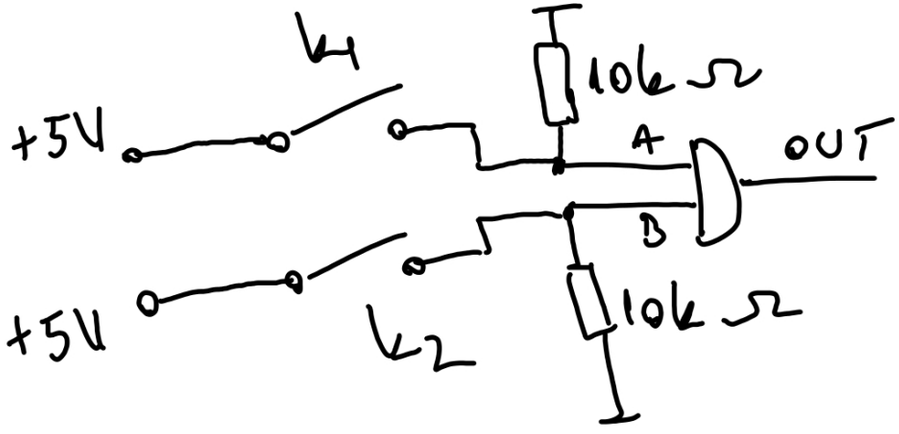



Soluția: rezistori de pull-down / pull-up.

Pull-down → menținem intrarea la 0 logic dacă nu avem 1 logic aplicat pe intrări

Pull-up → menținem intrarea la 1 logic dacă nu avem 0 logic aplicat pe intrări

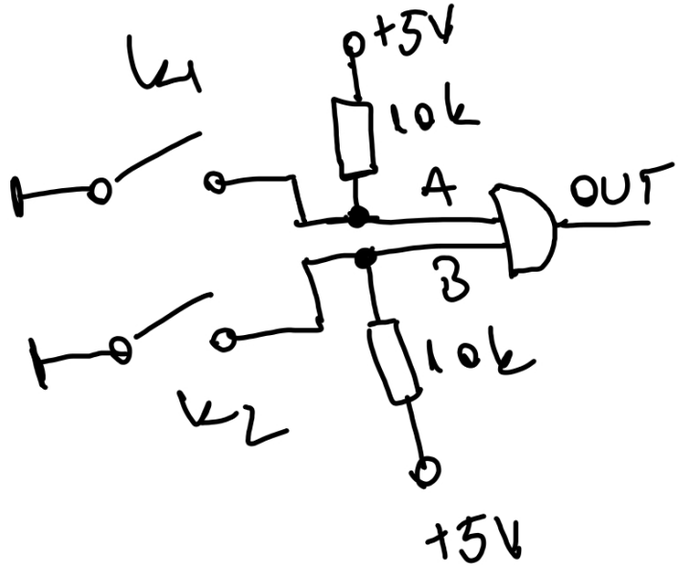
## Rezistori de pull-down




$K_1$ deschis $\Rightarrow A = 0\,V \Rightarrow 0$ logic

$K_1$ inchis $\Rightarrow A = 5V \Rightarrow 1$ logic.

## Rezistori de pull-up



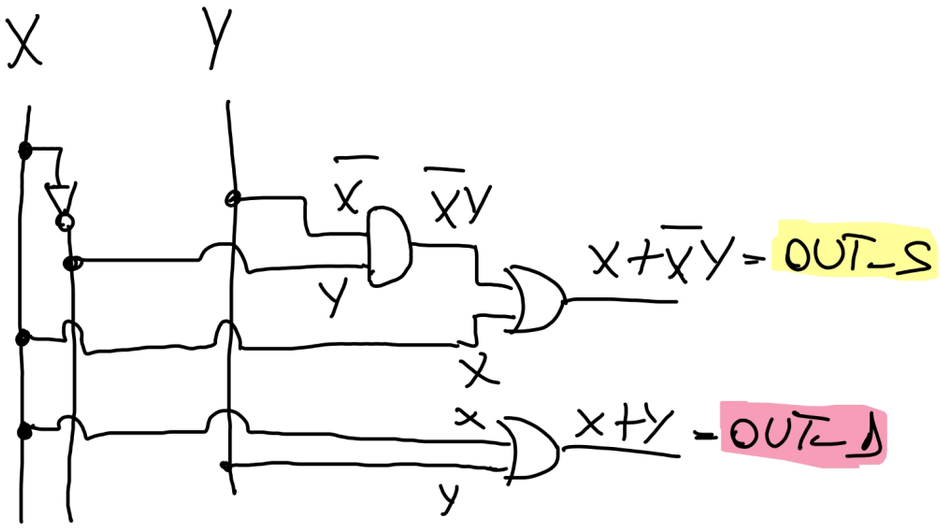

$K_1$ deschis $\Rightarrow A = 5V \Rightarrow 1$ logic

$K_2$ inchis $\Rightarrow A = 0V \Rightarrow 0$ logic

Teorema 1.6: $X + \bar{X}Y = X + Y$

OUT_S  OUT_D

Pasul 1: schemele cu porți logice.




Pasul 2: Tabelul de adevăr:

| X | Y | OUT_S | OUT_D |
|---|---|---|---|
| 0 | 0 | 0 | 0 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 1 |

$\Rightarrow OUT\_S = OUT\_D$

Teorema este validă