



# Preklopna vezja

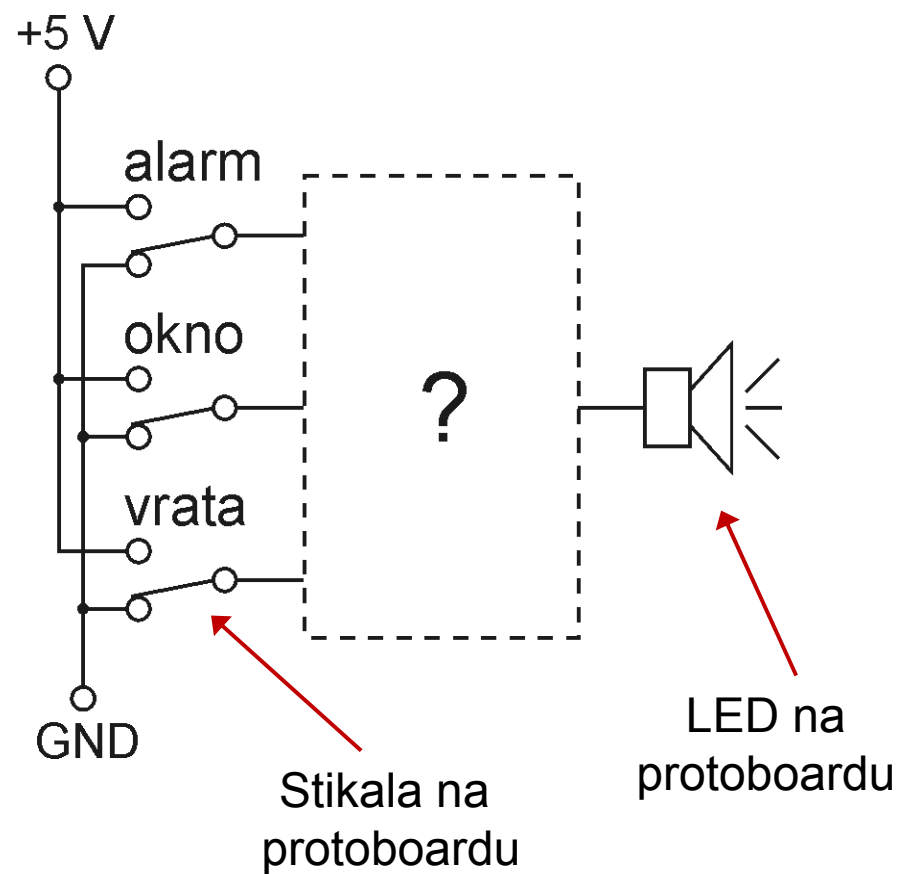
## 1. Vaja

Realizacija vezij z logičnimi vrati



## 1a. Krmilno vezje za alarmno napravo.

Alarm naj se vklopi, ko je aktiviran gumb za alarm (stikalo 1) in je hkrati odprto okno (stikalo 2) ali vrata (stikalo 3).





## 1b. Realizacija podane funkcije z min. številom NAND ali NOR

Vrata NAND: funkcijo v MDNO 2× negiramo

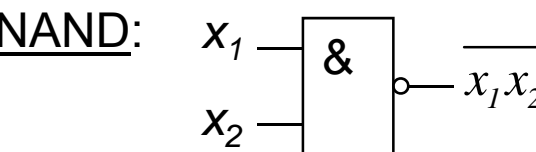
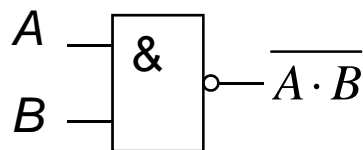
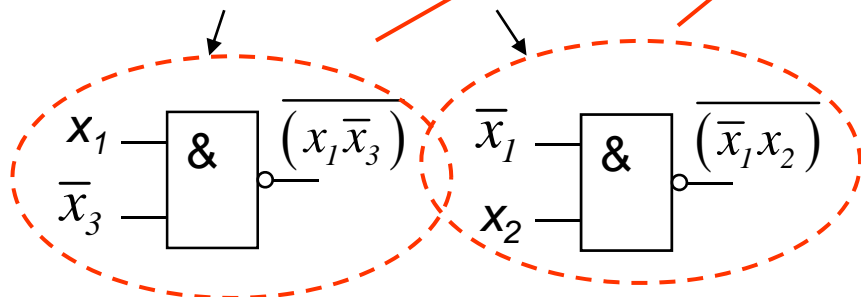
Primer:

$$f_{MDNO}(x_1, x_2, x_3) = x_1\bar{x}_3 + \bar{x}_1x_2$$

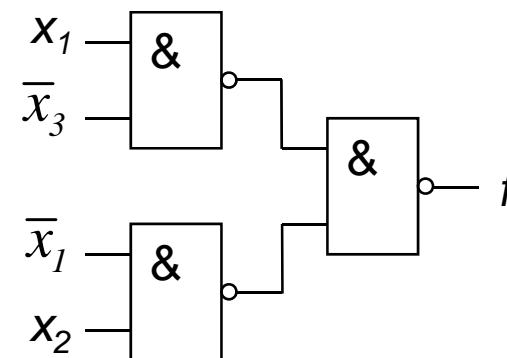
$$f = \overline{\overline{f_{MDNO}}} = \overline{(x_1\bar{x}_3 + \bar{x}_1x_2)}$$

$$f = \overline{(x_1\bar{x}_3) \cdot (\bar{x}_1x_2)} = \overline{A \cdot B}$$

$$A = \overline{(x_1\bar{x}_3)} \quad B = \overline{(\bar{x}_1x_2)}$$



$$f(x_1, x_2) = \overline{x_1x_2}$$





## 1b. Realizacija podane funkcije z min. številom NAND ali NOR

Vrata NOR: funkcijo v **MKNO** 2× negiramo

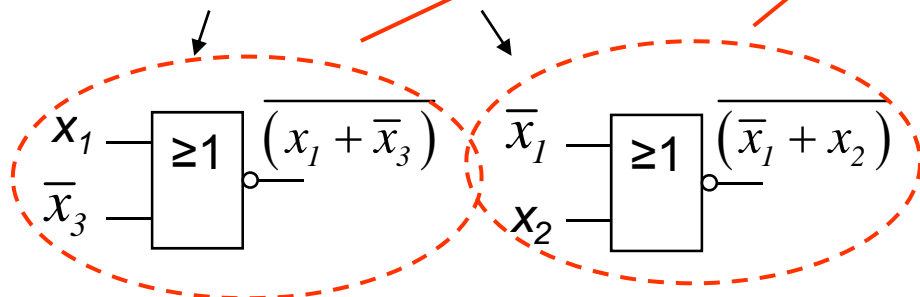
Primer:

$$f_{MKNO}(x_1, x_2, x_3) = (x_1 + \bar{x}_3) \cdot (\bar{x}_1 + x_2)$$

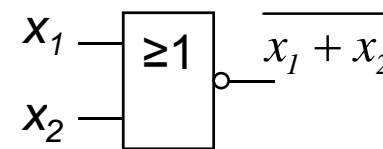
$$f = \overline{\overline{(x_1 + \bar{x}_3)} \cdot \overline{(\bar{x}_1 + x_2)}}$$

$$f = \overline{(x_1 + \bar{x}_3) + (\bar{x}_1 + x_2)} = \overline{A + B}$$

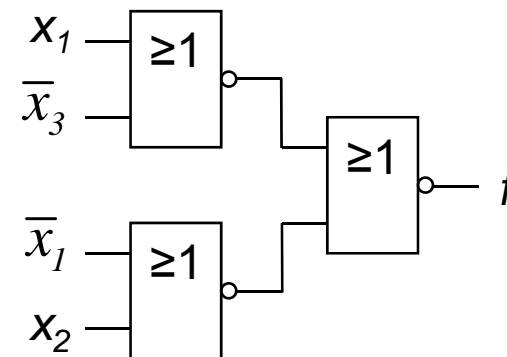
$$A = \overline{(x_1 + \bar{x}_3)} \quad B = \overline{(\bar{x}_1 + x_2)}$$



NOR:

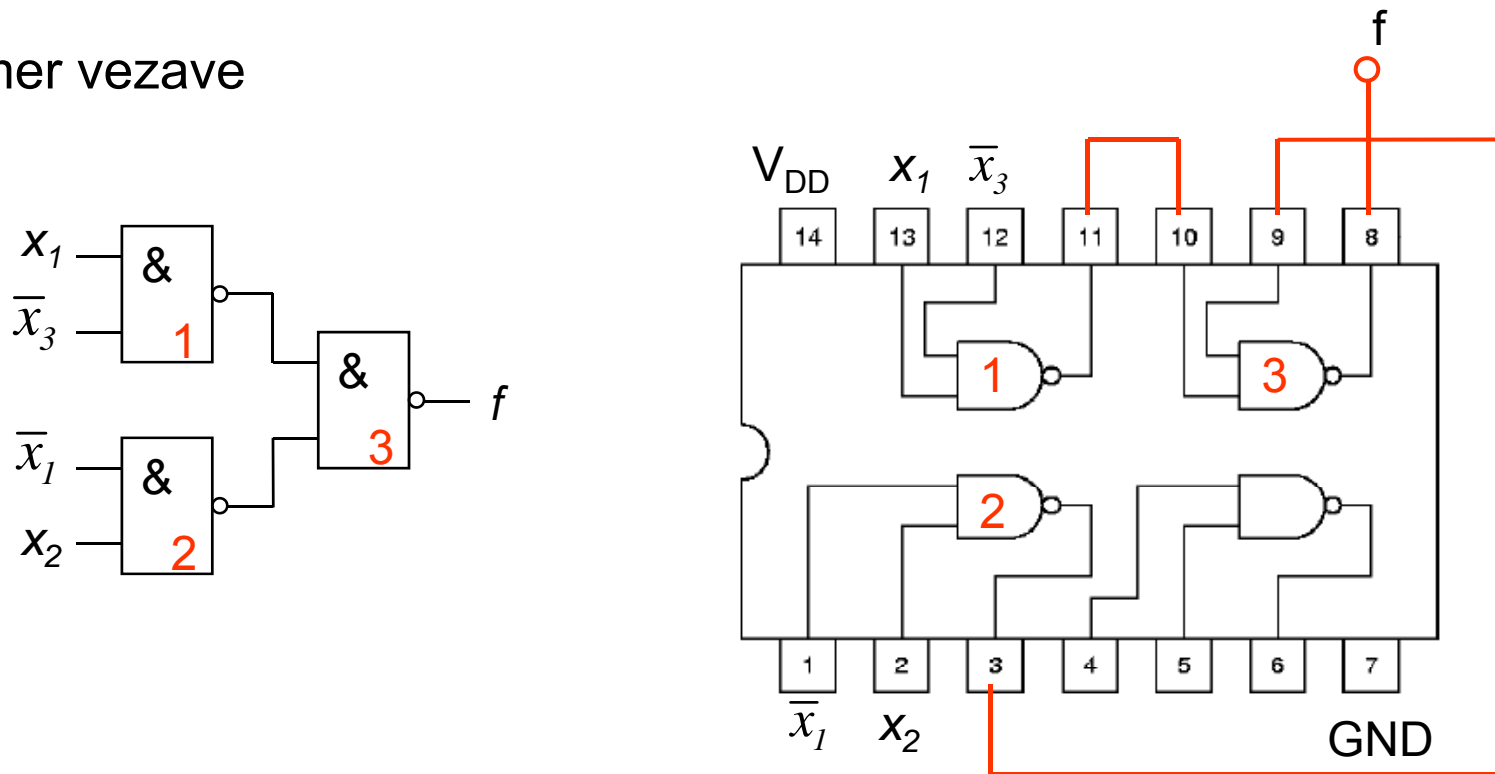


$$f(x_1, x_2) = \overline{x_1 + x_2}$$

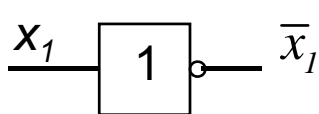




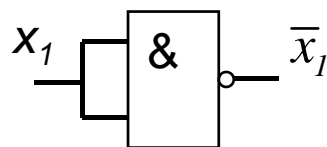
### Primer vezave



### Negacija spremenljivke



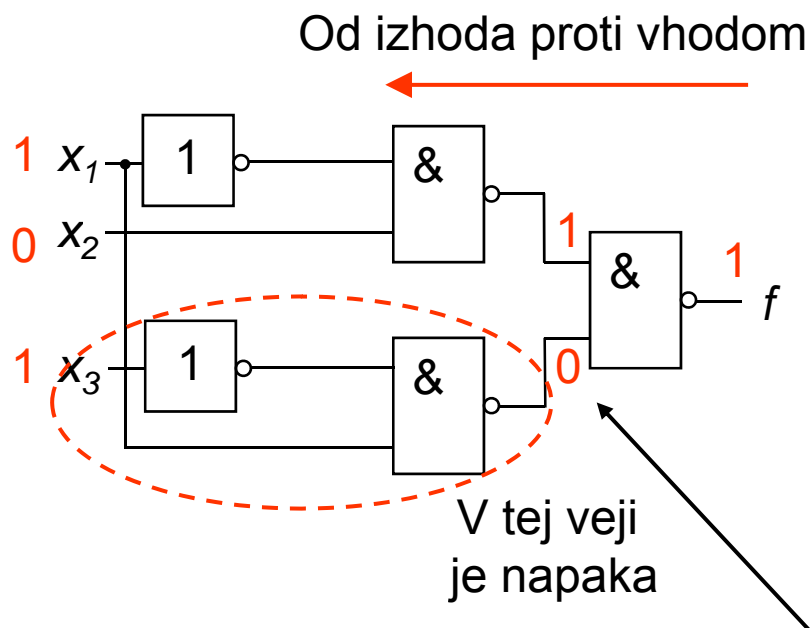
Negator  
(inverter)



NAND



## Iskanje napak v vezjih (NAND)



Napaka: namesto 0  
dobimo 1

$x_1$	$x_2$	$x_3$	$f$
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0 (1)
1	1	0	1
1	1	1	0

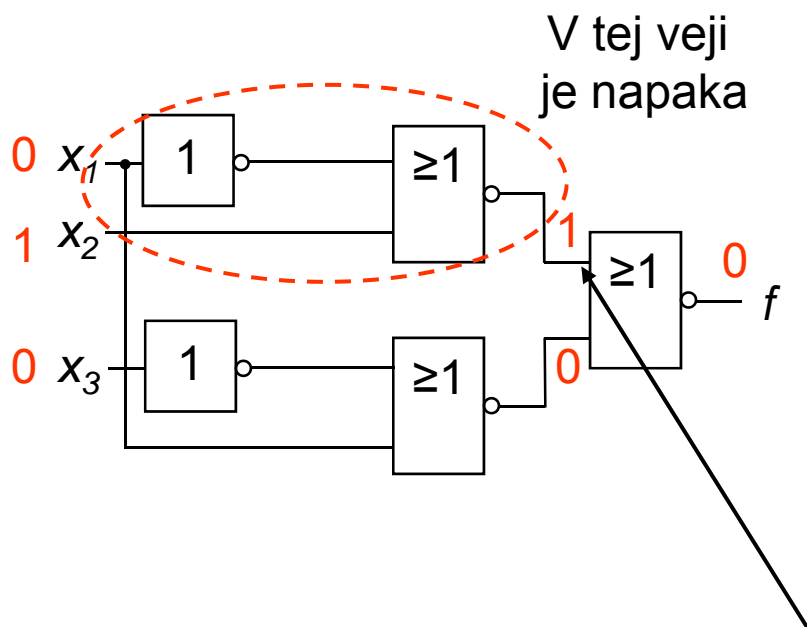
NAND

$x_1$	$x_2$	$f$
0	0	1
0	1	1
1	0	1
1	1	0

Na izhodu NAND lahko dobimo 1, kadar je vsaj eden od vhidov v ta vrata 0. Ta vhod je napačen.



## Iskanje napak v vezjih (NOR)



Napaka: namesto 1  
dobimo 0

$x_1$	$x_2$	$x_3$	$f$
0	0	0	0
0	0	1	0
0	1	0	1 (0)
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

NOR

$x_1$	$x_2$	$f$
0	0	1
0	1	0
1	0	0
1	1	0

Na izhodu NOR lahko dobimo 0, kadar je vsaj eden od vhodov v ta vrata 1. Ta vhod je napačen.



## Poročilo

- ❑ Naslov vaje
- ❑ Analitična rešitev
  - PKNO, PDNO
  - MKNO, MDNO
  - Veitch, tabela
- ❑ Simbolni diagram
- ❑ Vezalni načrt (Eagle)

