

3. DZ

① Min. lista osjetljivosti

```
process (O, cp)
begin
    if O = '1' then
        :
    elsif falling-edge(cp) then
        :
    end if;
end process;
```

② Ulæsi sinbrana?

-fjelaju u2 CP

vlazi: clock, M, N, O, P

at falling-edge (clock) then

~~sel := O & P;~~

case sel is

when . . .

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end case;

end if;

Ej. o i P

③ Asinkroni alaz naprived prioriteta

process (clock, M, N) asintotoni ulazi

begin

if rising-edge (clock) then

ent if

if M = '1' then

Qinf

if $N = '4'$ then

Qint <= '1');

ent if;

ent process; Nima veci prioritet od M.

④ Na što djeluje signal zatvarač CP?

elseif rising-edge(CP) then

end if;

=> na rastvorenim brid

⑤

nand2

a izlaz
b, c ulaz

$$f = \overline{d \cdot e \cdot c}$$

$$f = (\bar{d} + \bar{e}) \cdot e$$

$$f = \overbrace{e \cdot \bar{d}}^0 + \overbrace{e \cdot \bar{e}}^0 = \bar{e} \cdot \bar{d} = \bar{e} + d$$

s1:

$$b \leq i, c \leq \overline{e}, a \leq f$$

s2:

$$f = i \cdot e$$

$$\begin{matrix} i, e, d \\ \downarrow \quad \downarrow \quad \downarrow \\ a \quad b \quad c \end{matrix} \quad i = \overline{e \cdot d}$$

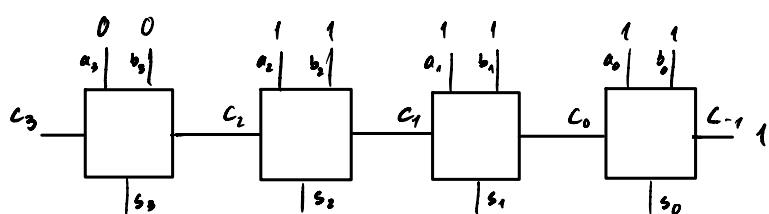
If $f \leq \text{NOT } e \text{ or } d$;

⑥ Paralelno binarno zbrojalo

- svako potpceno zbrojalo kasni 10ns

- u $t=0$ ns se na $C_{-1}=1$ te

$$\begin{array}{ccccccccc} a_3 & a_2 & a_1 & a_0 & , & b_3 & b_2 & b_1 & b_0 & s_3 & s_2 & s_1 & s_0 \\ 0 & 1 & 1 & 1 & , & 0 & 1 & 1 & 1 & 0 & 0 & 0 & 0 \end{array}$$



$$t_f = 10\text{ns}$$

$$\Delta t = 23 - 0 = 23\text{ns} \quad \left. \right\} 23 : 10 = 2 \text{ (2 kroga zbrojavanja)}$$

Tabelica binarnog zbrojanja

$$\begin{array}{cccc} a_3 & a_2 & a_1 & a_0 \\ 0 & 1 & 1 & 1 \end{array}, \quad \begin{array}{cccc} b_3 & b_2 & b_1 & b_0 \\ 0 & 1 & 1 & 1 \end{array}$$

A _x	B _x	C _x	S _x	C _x
0	0	0	0	0
0	0	1	1 0	
0	1	0	1 0	
0	1	1	0 1	
1	0	0	1 0	
1	0	1	0 1	
1	1	0	0 1	
1	1	1	1 1	

1. kruž (natom 0ns):

$$\begin{aligned} S_0 &= a_0 + b_0 + C_{-1} = 1 + 1 + 1 = 1, & C_0 &= 1 \\ S_1 &= a_1 + b_1 + C_0 = 1 + 1 + 0 = 0, & C_1 &= 1 \\ S_2 &= a_2 + b_2 + C_1 = 1 + 1 + 0 = 0, & C_2 &= 1 \\ S_3 &= a_3 + b_3 + C_2 = 0 + 0 + 0 = 0, & C_3 &= 0 \end{aligned}$$

2. kruž (natom 20ns)

$$\begin{aligned} S_0 &= a_0 + b_0 + C_{-1} = 1 + 1 + 1 = 1, & C_0 &= 1 \\ S_1 &= a_1 + b_1 + C_0 = 1 + 1 + 1 = 1, & C_1 &= 1 \\ S_2 &= a_2 + b_2 + C_1 = 1 + 1 + 1 = 1, & C_2 &= 1 \\ S_3 &= a_3 + b_3 + C_2 = 0 + 0 + 1 = 1, & C_3 &= 0 \end{aligned}$$

(7)

\Rightarrow Binarno asinkrono brojilo $\Rightarrow 30$ stanja

\Rightarrow falling edge bistabilni T s

\Rightarrow asinkroni ulaz za brisanje

$$30 = 16 + 8 + 4 + 2$$

$$Q_4 \ Q_3 \ Q_2 \ Q_1 \ Q_0$$

$$= (1 \ 1 \ 1 \ 1 \ 0)_{(2)} \quad \rightarrow = Q_4 \text{ AND } Q_3 \text{ AND } Q_2 \text{ AND } Q_1 \text{ AND NOT } Q_0$$

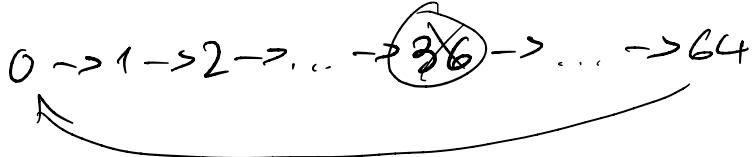
(11)

$$t_d = 15 \text{ ns}$$

$$t_L = 2 \cdot t_d = 30 \text{ ns}$$

$$t_H = 4 \cdot t_d = 60 \text{ ns}$$

(3.)



Treba dekodirati stanje 36.

$$⑩) f(A,B,C,D) = m\{0, 1, 3, 4, 7, 10, 11, 12, 13, 14, 15\}$$

	CD AB	00	01	11	10
00	1	1	0	1	2
01	1	0	5	1	6
11	1	1	4	1	7
10		8	9	11	10

bitni primarni implikanti (3)

> 3 boje $\Rightarrow 3$ mesta za obnovjenje $\Rightarrow 3$ min. oblik