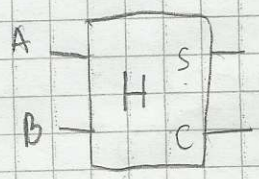
2. MASS INSTRUKCIJE

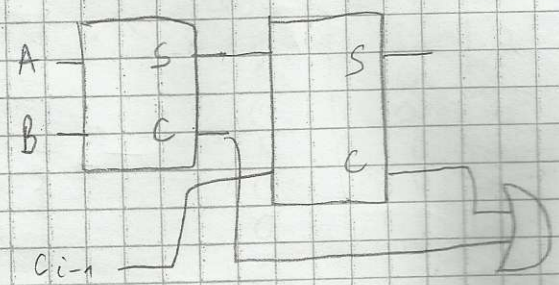


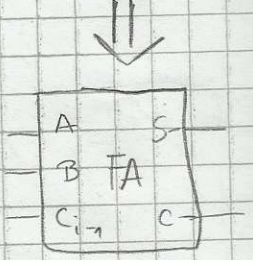
A	B	S	C
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

$S = A \oplus B$

$C = A \cdot B$

```
  0 0 0 1
  0 0 0 1
---------
  0 0 1 0
```



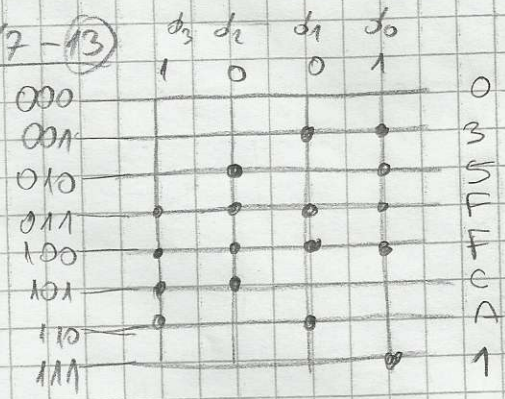


Formula sa slajdova

2009-17 8-bitno binarno zbrajalo

```
B8 - 1 0 1 1 1 0 0 0
AF - 1 0 1 0 1 1 1 1
-----------------------
     0 0 0 0 1 0 1 1   - 0B
-----------------------
     1 0 0 0 1 1 1 0   - rezultat
```

2006/7-13



3	2	1	0		
0	0	0	0	0	0
0	0	0	1	0	1
0	0	1	0	1	0
0	0	1	1	1	1
0	1	0	0	1	1
0	1	0	1	1	0
0	1	1	0	0	1
0	1	1	1	0	0
1	0	0	0	0	0
1	0	0	1	0	1
1	0	1	0	0	1
1	0	1	1	1	1
1	1	0	0	1	1
1	1	0	1	1	0
1	1	1	0	1	0
1	1	1	1	0	1

PLA NILI-NILI ⇒ ILI-I

ZAD 1. $\overline{X_1} + X_2$

II. $\overline{X_0} + \overline{X_2}$

III. $X_0 + \overline{X_2}$

IV. $\overline{X_0} + X_1$

$$f_1 = (\overline{X_1} + X_2)(\overline{X_0} + \overline{X_2})(\overline{X_0} + X_1)$$

X_2 \ X_0X_1	00	01	10	11
0	1	0	0	0
1	1	1	0	0

$$f_1 = \overline{X_0}\,\overline{X_1} + \overline{X_0}X_2$$

$$f_2 = (\overline{X_1} + X_2)(X_0 + \overline{X_2})$$

X_2 \ X_0X_1	00	01	11	10
0	1	0	0	1
1	0	0	1	1

$$f_2 = \overline{X_2}\,\overline{X_1} + X_0X_2$$

ZOKO 21 / (9) PLA tip NI-NI ⇒ I-ILI

$$f_1 = \bar{A}\bar{C} + \bar{A}\bar{B}CD + AC\bar{D}$$

$$f_2(A,B,C,D) = \Sigma m(0,1,3,4,11,15)$$

$$f_3(A,B,C,D) = \Pi M(0,1,3,4,7,12,13,14,15)$$

f_1:

CD \ AB	00	01	11	10
00	1	1		
01	1			
11	1		1	1
10				

f_2:

CD \ AB	00	01	11	10
00	0	0	0	1
01	0	1	0	1
11	0	0	0	1
10	1	1	0	1

f_1:

CD \ AB	00	01	11	10
00	1	1		
01	1	1		
11	1			
10			1	1

broj ulaza → 4 × 7 × 3 ← broj izlaza

broj zasebnosti

Tranzistori: NILI-NILI!

PAL (Nema min. višerazinske funkcije!)

ZAD $f = (\bar{A}+B+\bar{C})(\bar{A}+\bar{B}+\bar{D}) + \bar{C}D$ NI-NI ⇒ I-LI

$g = AB\bar{C}D + A\bar{D} + \bar{A}C$

1. $AB\bar{C}D$ } + g
2. y } + g
3. $\bar{X}$ } + f
4. $\bar{C}D$ } + f
5. $A\bar{B}C$ } + X
6. ABD } + X
7. $A\bar{D}$ } + y
8. $\bar{A}C$ } + y

$X = A\bar{B}C + ABD$ $y = A\bar{D} + \bar{A}C$

$\bar{X} = (\bar{A}+B+\bar{C})(\bar{A}+\bar{B}+\bar{D})$ $\bar{y} = (\bar{A}+D)(A+\bar{C})$

Odgovor: b)

Dimenzije PAL

Broj ulaza * Broj sklopova prvog polja * Broj izlaza

③ NILI-NILI ⇒ ILI-I

a	b	c	S	R	P_n	P_0
0	0	0	0	0	0	0
0	0	1	1	1	0	1
0	1	0	1	1	0	1
0	1	1	0	0	1	1
1	0	0	1	1	0	0
1	0	1	0	0	1	0
1	1	0	0	0	1	0
1	1	1	1	1	1	1

S R

c \ ab	00	01	11	10
0	0	1	0	1
1	1	0	1	0

4

P_n

0	0	1	0
0	1	1	1

3 +1

0	1	0	0
1	1	1	0

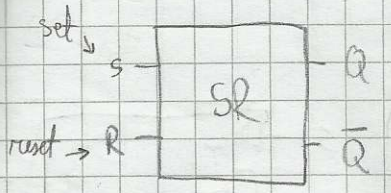
3 +1

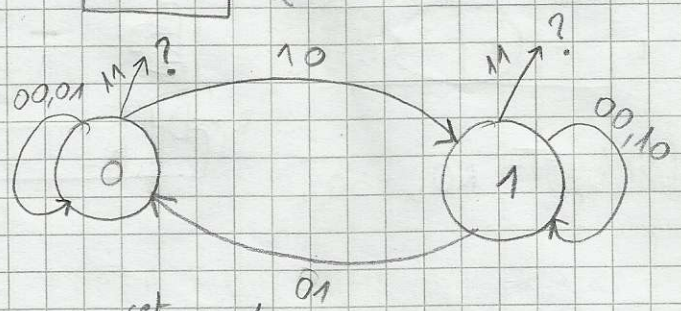
Izlazi: 3 × 4 · 3 × 3

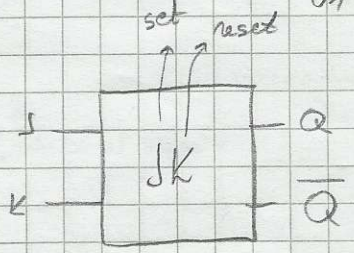
Biestabil

S	R	Q^{n+1}
0	0	Q^n
0	1	0
1	0	1
1	1	X

Q^n	Q^{n+1}	S	R
0	0	0	X
0	1	1	0
1	0	0	1
1	1	X	0

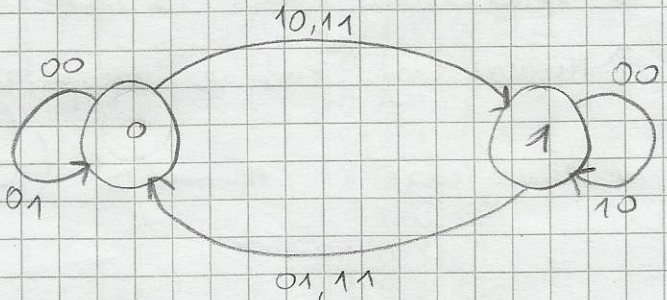


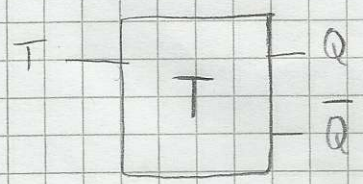




J	K	Q^{n+1}
0	0	Q^n
0	1	0
1	0	1
1	1	$\bar{Q}^n$

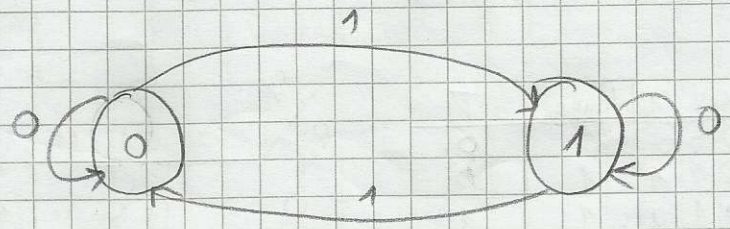
Q^n	Q^{n+1}	J	K
0	0	0	X
0	1	1	X
1	0	X	1
1	1	X	0

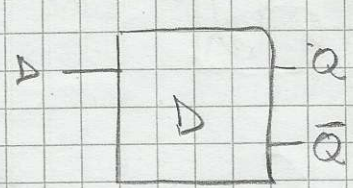




T	Q^{n+1}
0	Q
1	$\bar{Q}$

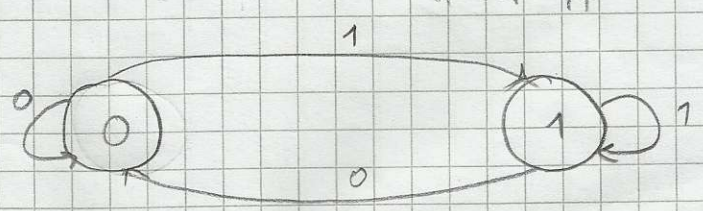
Q^n	Q^{n+1}	T
0	0	0
0	1	1
1	0	1
1	1	0





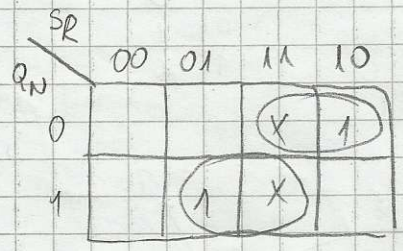
D	Q^{n+1}
0	0
1	1

Q^n	Q^{n+1}	D
0	0	0
0	1	1
1	0	0
1	1	1

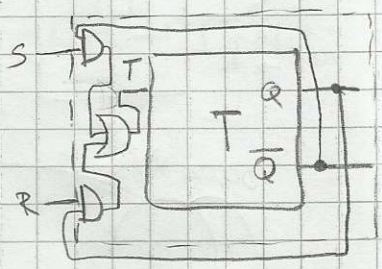


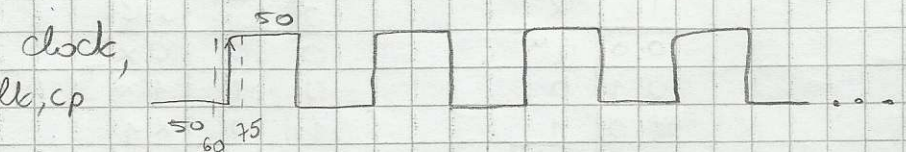
SR pomoću T bistabila

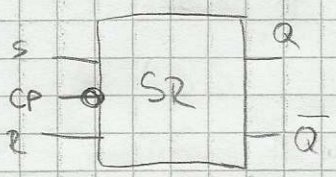
S	R	Q_n	Q_{n+1}	T
0	0	0	0	0
0	0	1	1	0
0	1	0	0	0
0	1	1	0	1
1	0	0	1	1
1	0	1	1	0
1	1	0	X	X
1	1	1	X	X



$P(S,R,Q_n) = T = RQ_n + S\overline{Q_n}$







○ ispred ulaza znači da radi na logičku 0

↑ rising edge, kad se mijenja iz 0 u 1 (▷)

↓ falling edge, 1 → 0 (○▷)

$t_{setup} = 10\,ns$

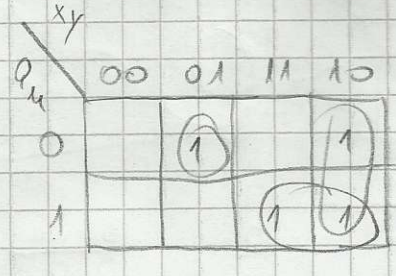
$t_{hold} = 5\,ns$

$t_d = 20\,ns$

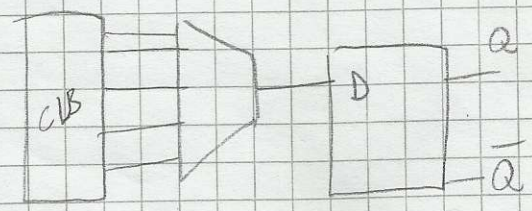
ZAD | xy pomoću T

x	y	Q_{n+1}
0	0	Q_n
0	1	1
1	0	$\overline{Q_n}$
1	1	0

x	y	Q_n	Q_{n+1}	T
0	0	0	0	0
0	0	1	1	0
0	1	0	1	1
0	1	1	1	0
1	0	0	1	1
1	0	1	0	1
1	1	0	0	0
1	1	1	0	1



(15)



$Q_{n+1} = \bar{A} \cdot \bar{Q} + B$

A	B	Q_n	Q_{n+1}
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1

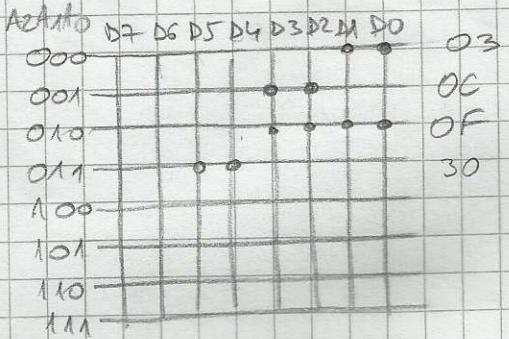
Odgovor: d)

2011 - ZI

(17) (P)ROM X · Y => 8 × 8

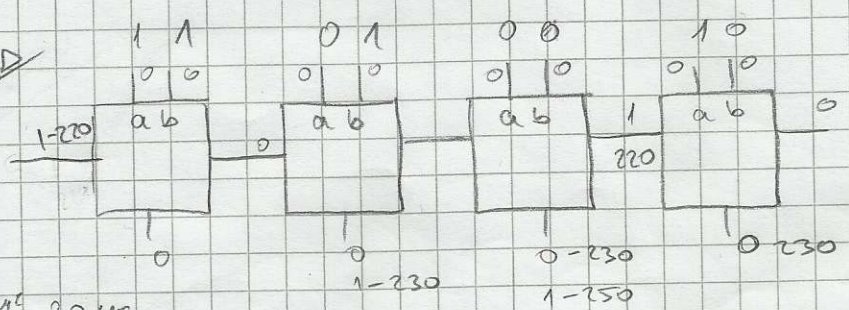
↘ vodoravno

↘ okomiti



N3	N2	N1	N0	f(n/2)+1
0	0	0	0	0 0 0 1
0	0	0	1	0 0 0 1
0	0	1	0	0 0 1 0
0	0	1	1	0 0 1 0
0	1	0	0	0 0 1 1
0	1	0	1	0 0 1 1
0	1	1	0	0 1 0 0
0	1	1	1	0 1 0 0
1	0	0	0	1 1 0 1
1	0	0	1	
1	0	1	0	
1	0	1	1	
1	1	0	0	
1	1	0	1	
1	1	1	0	
1	1	1	1	

ZAD



računarska obrada 20 ms

30 ms

t_{st} = 200 ms

a = 1001, b = 1100