1. 11000|10 → aritmetič. odesmo za 2 ujetke

11111000 (B)

2. trivjalno i teoretski

Grayer kod

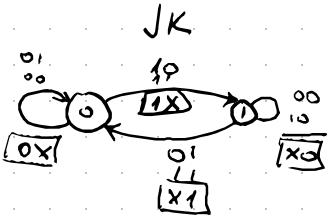
$S_0 = 00$

$S_1 = 01$

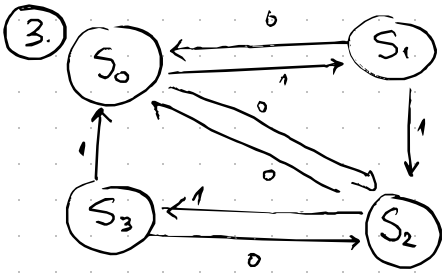
$S_2 = 11$

$S_3 = 10$

JK



3.



TS.

	Q_1^n	Q_0^n	x	Q_1^{n+1}	Q_0^{n+1}		J_1 K_1	J_0 K_0
S_0	0	0	0	1	1	S_2	1 X	1 X
	0	0	1	0	1	S_1	0 X	1 X
S_1	0	1	0	0	0	S_0	0 X	X 1
	0	1	1	1	1	S_2	1 X	X 0
S_3	1	0	0	1	1	S_2	X 0	1 X
	1	0	1	0	0	S_0	X 1	0 X
S_2	1	1	0	0	0	S_0	X 1	X 1
	1	1	1	1	0	S_3	X 0	X 1

J_1

x \ Q_1Q_0	00	01	11	10
0	1	0	X	X
1	0	1	X	X

$= Q_0 x + \overline{Q_0}\,\overline{x}$

J_0

x \ Q_1Q_0	00	01	11	10
0	1	X	X	1
1	1	X	X	0

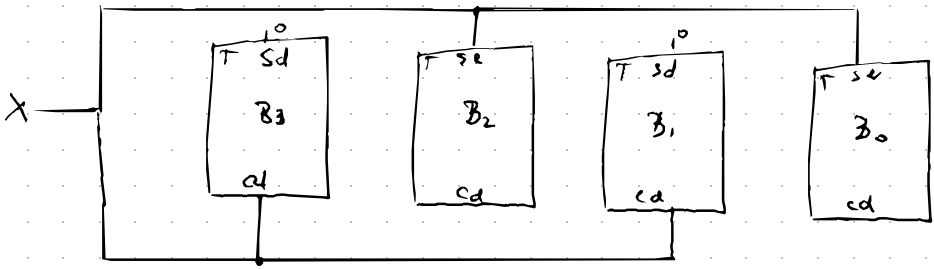
$= \overline{x} + \overline{Q_1}$ (C)

(4) Mooreov automat - izlaz ovisi samo o stanjima, ne ulazima

(c) ni koji imaju x otpadaju

S - set
C - clear

(5)



aktivirajuć x - prelazak u stanje $Q_3 Q_2 Q_1 Q_0 = 0\ 1\ 0\ 1 = 5$

* brojilo unazad

Sigurno dio ciklusa

$5 \to 4 \to 3 \to 2 \to 1 \to 0 \to 15 \to 14 \to 13$

12

prelazna pojava

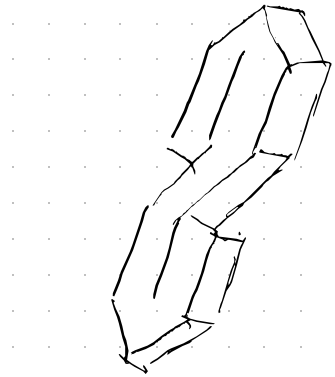
"x" prebacuje u početno stanje

- treba detektirati stanje 12:

$Q_3 Q_2 Q_1 Q_0 = 1100$

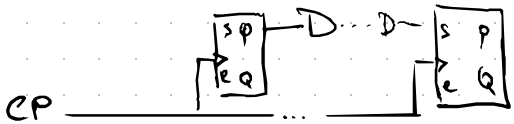
$A: X \to Y$

Pa kako si ti danas?


MIRACOIN

6. f_{max} = ?

6 bitno binarno sinkronog brojila



1.) nakon prvog brida takta mijenja se Q nakon t_{db}

2.) Nakon t_{db}-a, na Q je neka međuvrijednost koja mora propagirati kroz logičke sklopove (njih n) → $\sum_{i=1}^{n} t_{ds}\ (n \cdot t_{dls})$

3.) Nakon prolaska kroz l.s. mora se ta međuvrijednost postaviti na ulaz slj. Bistabila → t_{setup}

ima 6 bistabila, paralelni prijenos → n = 1

$$f_{max} = \frac{1}{t_{db} + n \cdot t_{dls} + t_{setup}} = \frac{1}{20 + 5 + 25} = \frac{1}{50} = 20\,MHz$$

7. asinkrono binarno brojilo

3 bistabila T

- asinkroni ulaz Sd
- ciklus duljine 4

111 → 7 → 0 → 1 → 2 → 3 → detektirati tranzijentno

$$f_{max} = \frac{1}{n \cdot t_{db} + t_{ci}} = \frac{1}{3 \cdot t_{db} + t_{ci}}$$

n: broj bistabila čiji se najgorem slučajem mijenjaju stanje

$$= \frac{1}{3 \cdot 75 + 30} = \frac{1}{105\,ns}$$

$= 9.\overline{523809}\,MHz$ (E)

111
000 → sva 3 se mijenjaju

n = 3

8. Bistabili JK

- sekvencijski sklop
- prvih 10 brojeva Fibonaccijevog niza

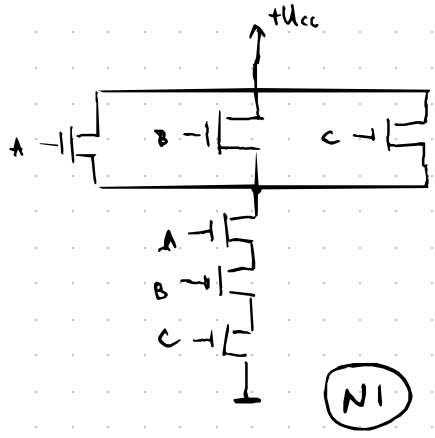
1, 1, 2, 3, 5, 8, 13, 21, 34, 55

minimalno je 4 bistabila jer je 10 stanja → $2^3 < 10 < 2^4$

9. CMOS

PUN – 3 paralelno spojena p-mosa

PDN – 3 serijski spojena n-mosa



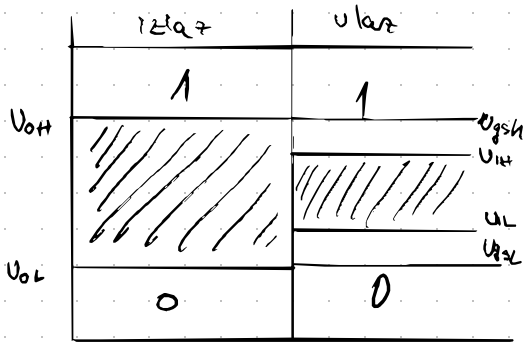
$f = \overline{A} + \overline{B} + \overline{C} = \overline{A \cdot B \cdot C}$

$g = A \cdot B \cdot C \rightarrow \overline{f} = g = \overline{\overline{A \cdot B \cdot C}}$

10. $f_1 = 100MHz$ $\quad U_1 = 3V$ $\quad f_2 > f_1$ $\quad P_{d_1} = P_{d_2}$

$U \downarrow \rightarrow U_{gs} \downarrow$

$U_{gs} = 0.2V$



$U_{OL\,max} = 0.3U$ $\quad U_{ILmax} = 0,4U$

$U_{OH\,max} = 0,7U$ $\quad U_{IHmax} = 0,6U$

$P_d = f \cdot C \cdot U^2$

---

ideja je da f_2 povećamo toliko da U_2 ne smanjujemo ispod 2V.

$U_{gs} = \min((0,7-0,6), (0,4-0,3))$

$= \underline{0,1U}$

$U_{gs} = 0.2V$

$0.1U = 0,2V$

$\underline{U = 2V}$

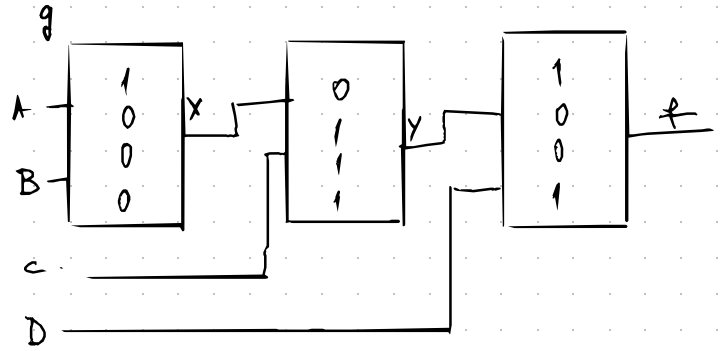
$P_{d_1} = P_{d_2}$

$f_1 \cancel{C} U_1^2 = f_2 \cancel{C} U_2^2$

$100MHz \cdot 9 = f_2 \cdot 4$

$f_2 = \frac{900}{4} = \underline{225Hz}$

11.



A	B	X
0	0	1
0	1	0
1	0	0
1	1	0

X	C	Y
0	0	0
0	1	1
1	0	1
1	1	1

Y	D	f
0	0	1
0	1	0
1	0	0
1	1	1

↓ NILI

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

↓ 14

$Y = X + C$

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

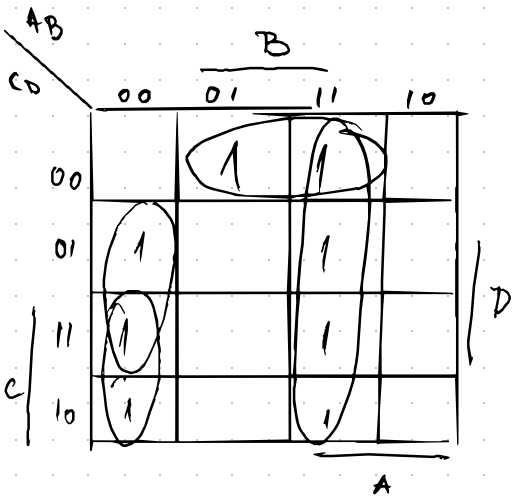
$\overline{Y \oplus D} = \bar{Y}\bar{D} + YD$

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

$= (\overline{\bar{A}\bar{B}} \cdot \bar{C})\bar{D} + \bar{A}\bar{B}D + CD$

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

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



c

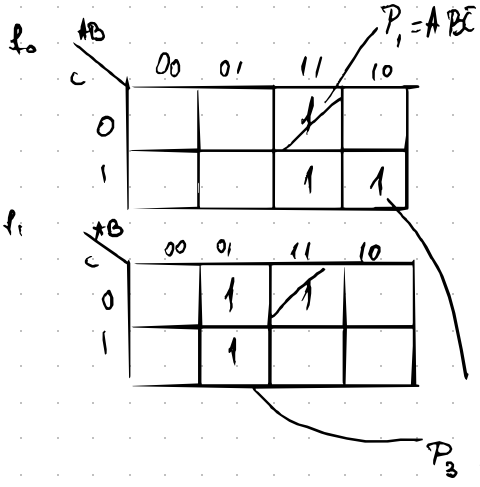
12. PLA - dije programirljive

$f_0 = A\bar{B} + AC$

$f_1 = \bar{A}B + B\bar{C}$

Kod PLA ako su dije programirljive točno možemo reći koji produkt dovesti na koji izlaz?

N1 - N1 - broj produkata



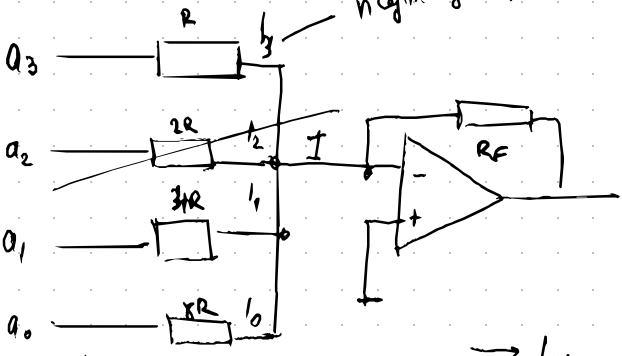
Dimenzije PLA

Br. ulaza : 3

Br. produkata : 3

Br. izlaza : 2 (br. funkcija)

13. 4-bitni DA pretvornik - kod 8421



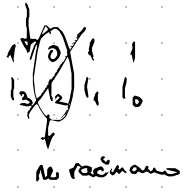
$I_3 = 4mA$

$I_1 = \frac{4}{4} = 1mA$

$I_0 = 0{,}5mA$

$U_{ref} = -4V$

podatak 11 = 1011



$U_{12} = -I \cdot R_f$

$\rightarrow I_{ukupno} = I_3 + I_1 + I_0 = 95 + 1 + 4$

$I_{ukupno} = 5{,}5mA$

$R_f = -2k\Omega$

$U_{12} = -5{,}5mA \cdot (-2k\Omega) = -11V$

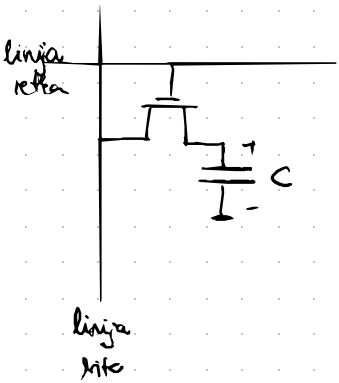
14. Uvijek jednako, samo zapamti

15. $4 \times (1024 \times 8 \text{ bita})$ fat (C)

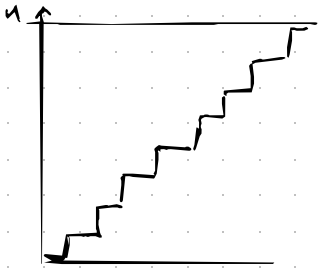
16. $2\frac{1}{2}$D organizacija

$1\ FIZ\ RIJEČ = 1 \cdot 2^4$ log riječi $= 16 \cdot 8$ bita $= 2^4 \cdot 2^3 = 2^7$ bitova (C)

17. DRAM



18. $\varepsilon_k = \pm \frac{U_k}{2} \rightarrow U_k = \frac{U_{max}}{2^n} = \frac{6.2\,V}{2^5 - 1} = \frac{6.2}{31}$



$\varepsilon_k = \frac{0,2\,V}{2} = \pm 0.1\,V$

(C)

19. 5-bitovna brojila (vježbe 2)

n_{pp} - duljina ciklusa 5-bit. bin. brojila s paralelnim prijenosom
↳ 2^5 stanja (0 – 31)

n_{sp} - -||- sa serijskim } vježbe/ostvarenje

↳ 2^5 stanja (0-31)

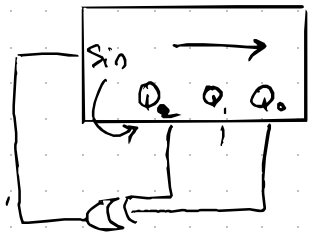
n_{pb} - prstenasto brojilo → 5

n_{up} - ukršteno prstenasto → 10 (2.5)

$n_{pp} = n_{spp} > n_{cp} > n_{pb}$

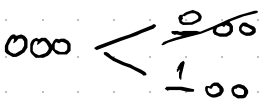
(D)

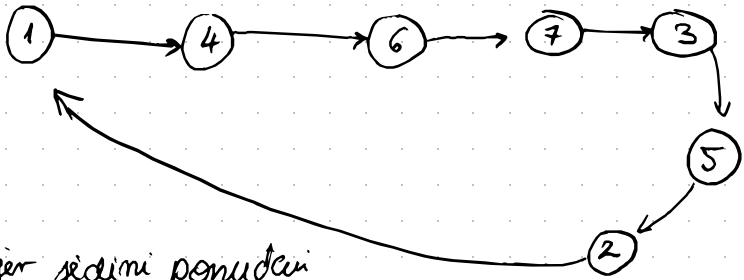
21.



Q_2 Q_1 Q_0	S_{in}	Q_2^{t+1} Q_1^{t+1} Q_0^{t+1}
0 0 0	0	0 0 0
0 0 1	1	1 0 0
0 1 0	0	0 0 1
0 1 1	1	1 0 1
1 0 0	1	1 1 0
1 0 1	0	0 1 0
1 1 0	1	1 1 1
1 1 1	0	0 1 1

← nema ispravan start





A jer jedini ponudeni

da nema ni $4 \rightarrow 6 \rightarrow 7$ dijelom ciklusa

22. $f = A + B + C(\bar{D} + \bar{E} + F + \bar{G})$

koliko p kanalnih ?

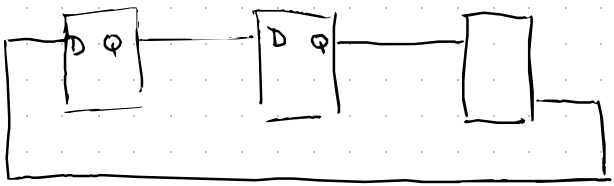
većina varijabli nije komplementirana $N > k$

↓

realiziramo $\bar{f}$ (u kojoj će biti sve onim G)

ulaz u krug

23.



3-bitni posmačni registar