IMPLEMENTACIJA LOG. SKLOPOVA

1. Koja fja ostvaruje neg. stlop u dlg. log.?

A	B	f
-2V	-2V	-4V
-2V	-4V	-4V
-4V	-2V	-4V
-4V	-4V	-2V

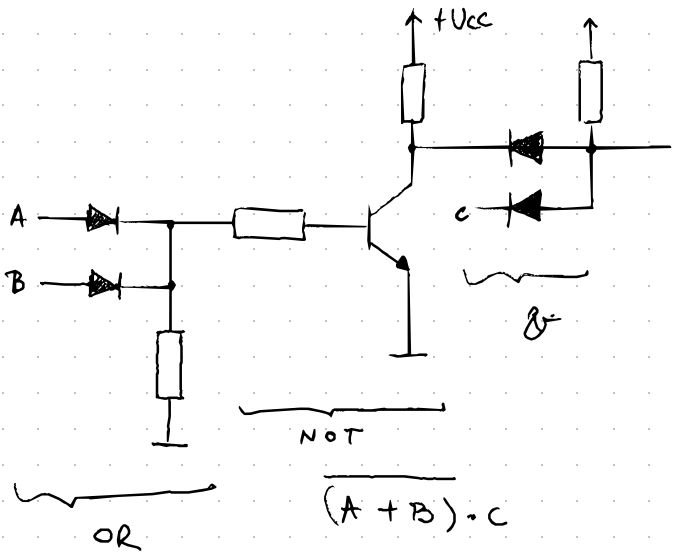
pozitivna

0	0	1
0	1	1
1	0	1
1	1	0

→ NI => NILI u neg. log

(B)

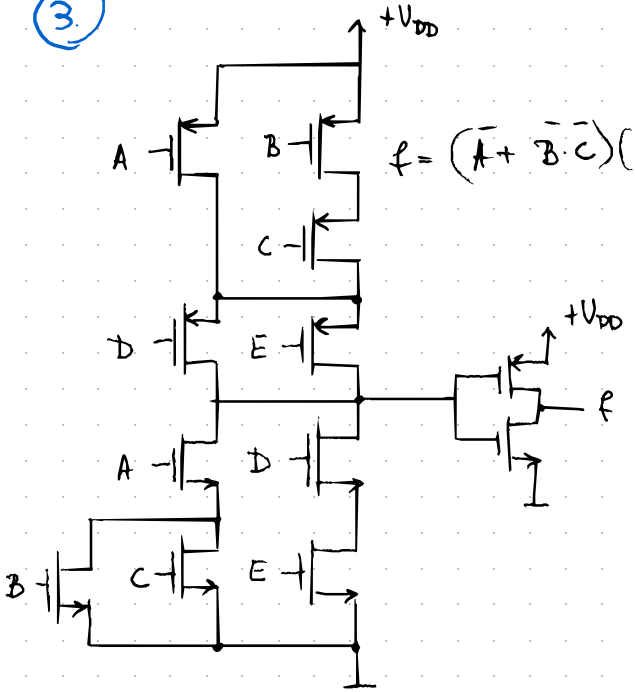
2.



A	B	C	f	
0	0	0	0	0
0	0	1	1	1
0	1	0	0	2
0	1	1	0	3
1	0	0	0	4
1	0	1	0	5
1	1	0	0	6
1	1	1	0	7

(A) $\Pi M(0,2,3,4,5,6,7)$

3.



$f = (\bar{A} + \bar{B}\cdot\bar{C})(\bar{D} + \bar{E})$

$\bar{f} = g = \overline{(\bar{A} + \bar{B}\cdot\bar{C})(\bar{D}+\bar{E})}$

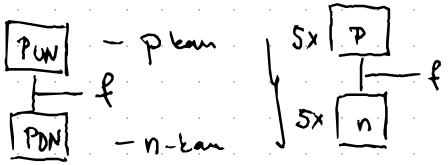
$g = \overline{(\bar{A} + \bar{B}\cdot\bar{C})} + \overline{(\bar{D}+\bar{E})}$

$g = \bar{\bar{A}}\cdot(\bar{\bar{B}}+\bar{\bar{C}}) + \bar{\bar{D}}\cdot\bar{\bar{E}}$

$\boxed{g = A(B+C) + DE}$

(+)

4. Koliko je minimalno potrebno p-kanalnih MOSFETA da bi se u CMOS tehnologiji ostvarila $f = (A+B)(C+D\cdot E)$?

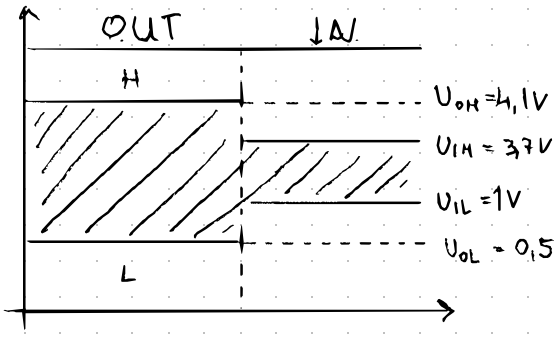


direktna: (5 invertora + 5 p-kan) + 5 n-kan

10 p-kan

5. $U_{OH\,min} = 4{,}1V$ $\quad U_{IH\,min} = 3{,}7V$

$U_{OL\,max} = 0{,}5V$ $\quad U_{IL\,max} = 1V$



$U_{GS} = \min(U_{GSV} - U_{GSN})$

$U_{GSV} = U_{OH} - U_{IH} = 0{,}4V$

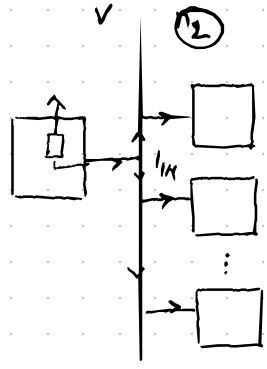
$U_{GSN} = U_{IL} - U_{OL} = 0{,}5V$

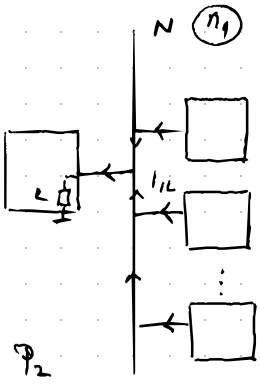
$\boxed{U_{GS} = 0{,}4V}$ (C)

6. n – faktor grananja

	I_{OL} /mA	I_{IL} /μA	I_{OH} /μA	I_{IH} /μA
P_1	16	1600	200	20
P_2	8	400	400	20

$P_2 - 1$





$I_{OH} \geq n_2 \cdot I_{IH}$

$n_2 \leq \left\lfloor \frac{I_{OH}}{I_{IH}} \right\rfloor = \left\lfloor \frac{400}{20} \right\rfloor = 20$

$n_2 \leq \left\lfloor \frac{I_{OL}}{I_{IL}} \right\rfloor = \left\lfloor \frac{8}{0{,}4} \right\rfloor = 20$

$n_1 \leq \left\lfloor \frac{I_{OH}}{I_{IH}} \right\rfloor = \left\lfloor \frac{200}{20} \right\rfloor = 10$

$n_1 \leq \left\lfloor \frac{I_{OL}}{I_{IL}} \right\rfloor = \left\lfloor \frac{16}{1.6} \right\rfloor = 10$

$n_{2-1} = \left\lfloor \frac{16}{0{,}4} \right\rfloor = 40$

$n_{2-1} = \left\lfloor \frac{200}{20} \right\rfloor = 10$

$\Rightarrow 10$

(gledamo manji)

$n_1 / n_2 / n_{2-1} = 10/20/10$

(D)

(7.) Kako treba promijeniti napon napajanja dig. sklopa ako f povećamo za 10%, a dinamička disipacija mora ostati ista? Tolerancija je 1%.

$f_2 = 1.1 f_1$

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

$p_{d1} = p_{d2}$

$f_1 \cdot C \cdot U_1^2 = f_2 \cdot C \cdot U_2^2$

$f_1 \cdot U_1^2 = 1.1 \cdot f_1 \cdot U_2^2$

$U_1^2 = 1.1\, U_2^2 \;/\sqrt{}$

$U_2 = \frac{U_1}{\sqrt{1.1}} = 0.95\, U_1$

↳ smanjit za 5% (B)