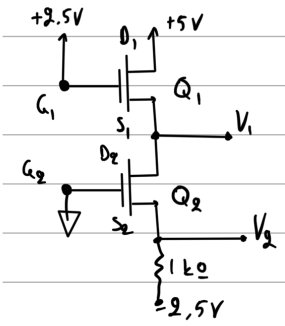
Άσκηση



$V_t = 0,9\,V$ $\quad k_n' \frac{W}{L} = 1,5\,mA/V^2$

Q_1, Q_2 όμοια

Κορεσμός: $V_{DS} > V_{GS} - V_t$

$I_D = \frac{1}{2} k_n (V_{GS} - V_t)^2$

$k_n = k_n' \frac{W}{L}$

$k_n' = \mu_n C_{ox}$

Υποθέτουμε λειτουργία σε κορεσμό:

$V_{GS_2} = 0 - V_2 = -V_2 \quad (1)$

$V_2 = I_D \cdot 1k\Omega - 2,5V \rightarrow I_D = V_2 - 2,5 \quad (2)$

$I_D = \frac{1}{2} k_n (V_{GS_2} - V_t)^2 \xrightarrow{(1)\wedge(2)} V_2^2 + 0,467 V_2 - 2,5236 \rightarrow V_2 = -1,84V$

Οπότε $I_D = 0,66mA$, $V_{GS_2} = 1,84\,V$

Επειδή Q_1, Q_2 όμοια με ίδιο I_D: $V_{GS_1} = 1,84V$

$V_1 = 2,5 - 1,84 \rightarrow V_1 = 0,66V$

$V_{DS_1} = 5 - 0,66 = 4,34V$

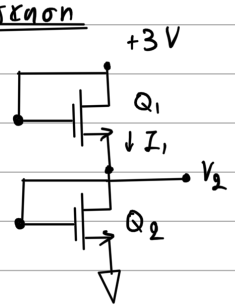
$V_{GS_1} - V_t = 0,84 - 0,9 = 0,94V$

$V_{DS_1} > V_{GS_1} - V_t$ → κορεσμός

($V_{GS_1} - V_t = V_{ov}$)

$V_{ov} = V_{GS} - V_t$

Άσκηση



$\mu_n C_{ox} = 270\,\mu A/V^2$

$L = 1\mu m$ $\quad V_t = 0,5V$ $\quad$ • I_1? , V_2?

$W = 3\mu m$ $\quad Q_1, Q_2$ όμοια

(Κορεσμός) $\quad$ ίδιο I_D

Όμοια $Q_{1,2}$ και ίδιο $I_D \rightarrow V_{GS_1} = V_{GS_2} = V_{GS}$

$3V = V_{GS_1} + V_{GS_2} = 2V_{GS} \rightarrow V_{GS} = 1,5V \rightarrow \boxed{V_2 = V_{GS} = 1,5V}$

$I_1 = I_D = \frac{1}{2} \mu_n C_{ox} \frac{W}{L} V_{ov}^2 = \frac{1}{2} 270 \frac{3}{1} (1,5 - 0,5)^2 \rightarrow \boxed{I_1 = 405\,\mu A}$