

SANTA CLARA UNIVERSITY	ELEN 115 – Spring 2023	S. Krishnan
Homework #7		

1. The MOS transistors in Figure 1 are used as switches.

$V_{TN} = 1\text{ V}$, $V_{TP} = -1\text{ V}$, $\lambda = 0$, $k_n' = 20\mu\text{A/V}^2$ and $k_p' = 10\mu\text{A/V}^2$.

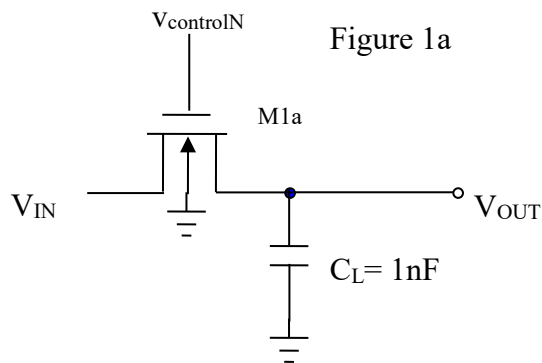
All device dimensions are $500\mu\text{m}/10\mu\text{m}$

- (a) Initial voltage condition on capacitor C_L is 0V. V_{IN} is 6V.

The voltage v_{controlN} switches from 0V to 5V and stays at 5V till the capacitor settles to its final value.

Clearly indicate the direction of flow of current in the circuit.

Find the final value of the output voltage V_{OUT}



- (b) Use Figure 1(a) for this part.

Initial voltage condition on capacitor C_L is 0V. V_{IN} is 5V.

The voltage v_{controlN} switches from 0V to 6V and stays at 6V till the capacitor settles to its final value.

Clearly indicate the direction of flow of current in the circuit.

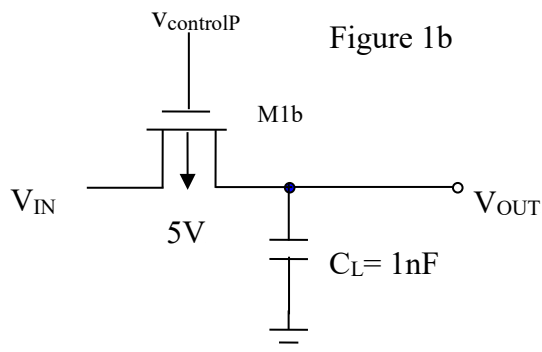
Find the final value of the output voltage V_{OUT}

- (c) Initial voltage condition on capacitor C_L is 5V. V_{IN} is 2V.

The voltage v_{controlP} switches from 5V to 0V and stays at 0V till the capacitor settles to its final value.

Clearly indicate the direction of flow of current in the circuit.

Find the final value of the output voltage V_{OUT}



2. Assume the MOS transistors in Figure 1 have $V_{TN} = 1\text{ V}$, $V_{TP} = -1\text{ V}$, $\lambda = 0$. Given $k_n' = 20\mu\text{A/V}^2$ and $k_p' = 10\mu\text{A/V}^2$. All device dimensions are in μm . Find the value of labeled currents and voltages. What is the region of operation of the transistors in each figure? Clearly show how you arrive at your answer.

