

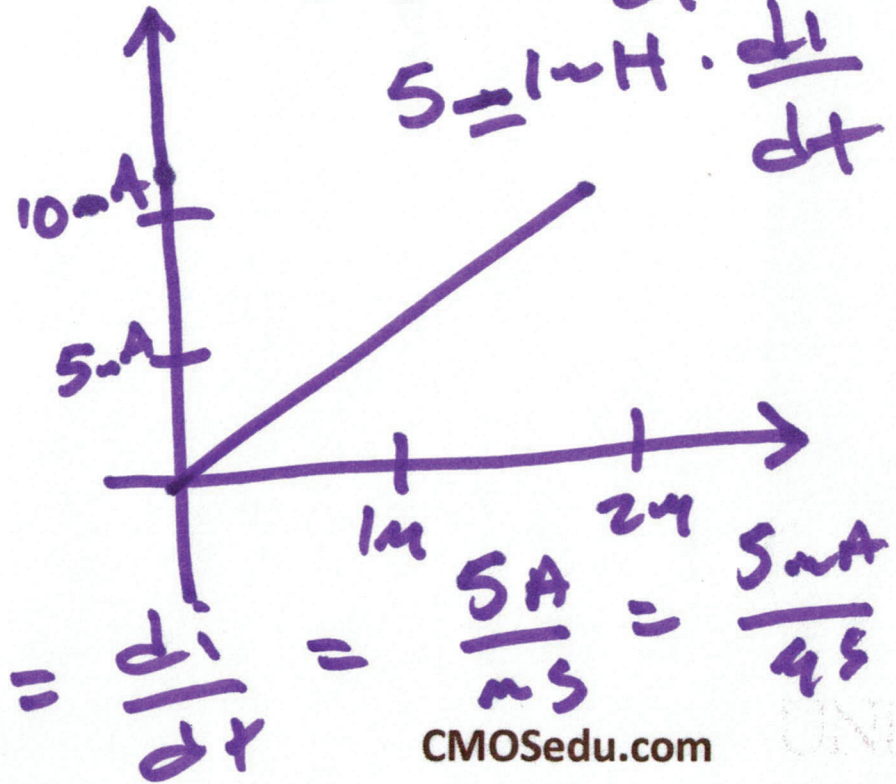
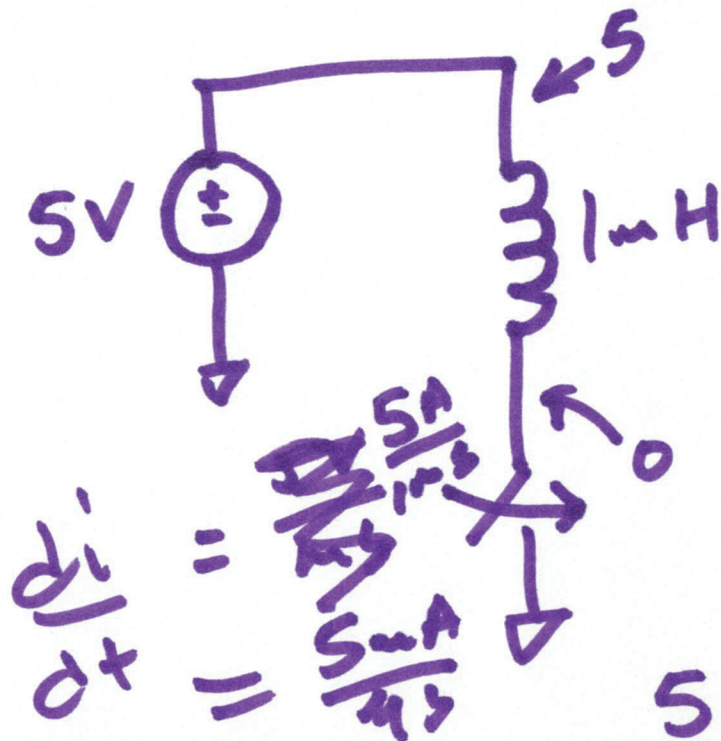
EE 421 / ECG 621

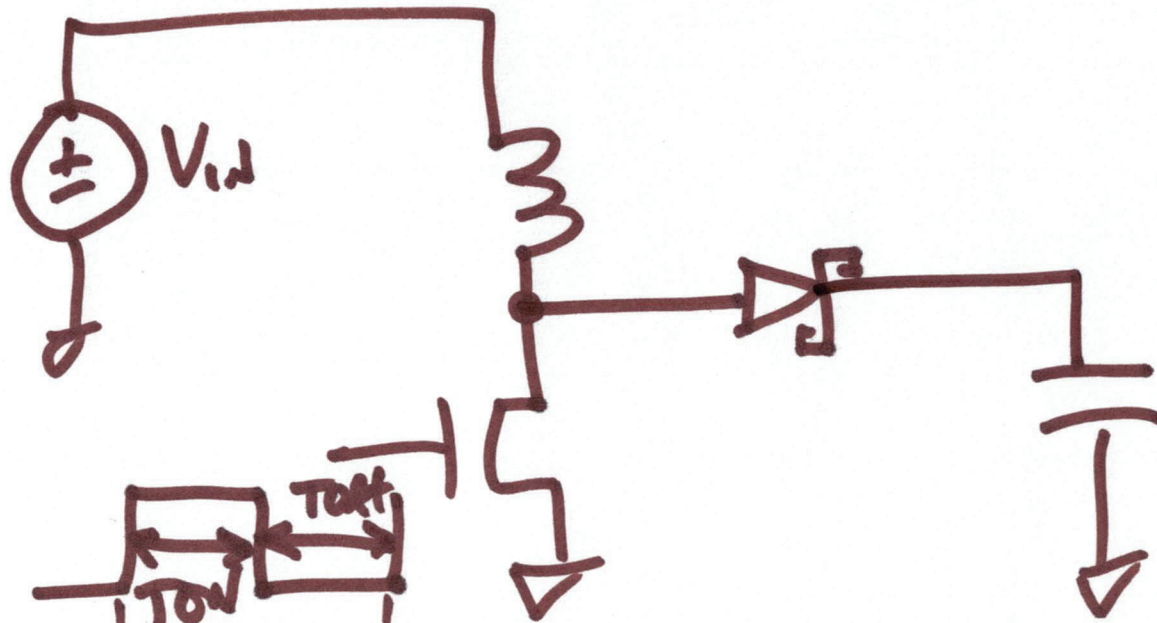
Digital IC Design

Lecture 15

OCT. 18, 2021.

$$V = L \cdot \frac{di}{dt}$$
$$5 = 1 \mu\text{H} \cdot \frac{di}{dt}$$





$$T = \text{period} = \frac{1}{f}$$

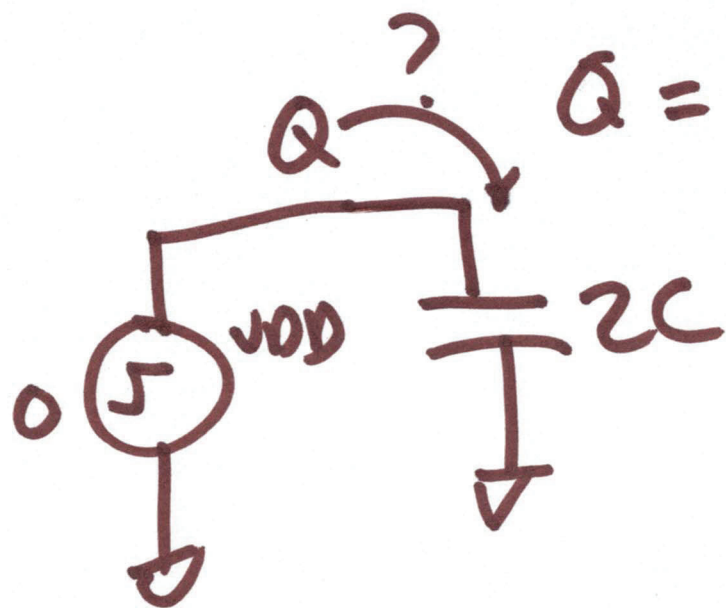
$$= T_{\text{ON}} + T_{\text{OFF}}$$

2)

Digital Models

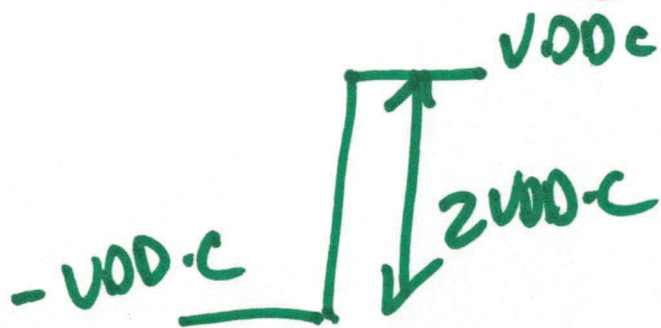
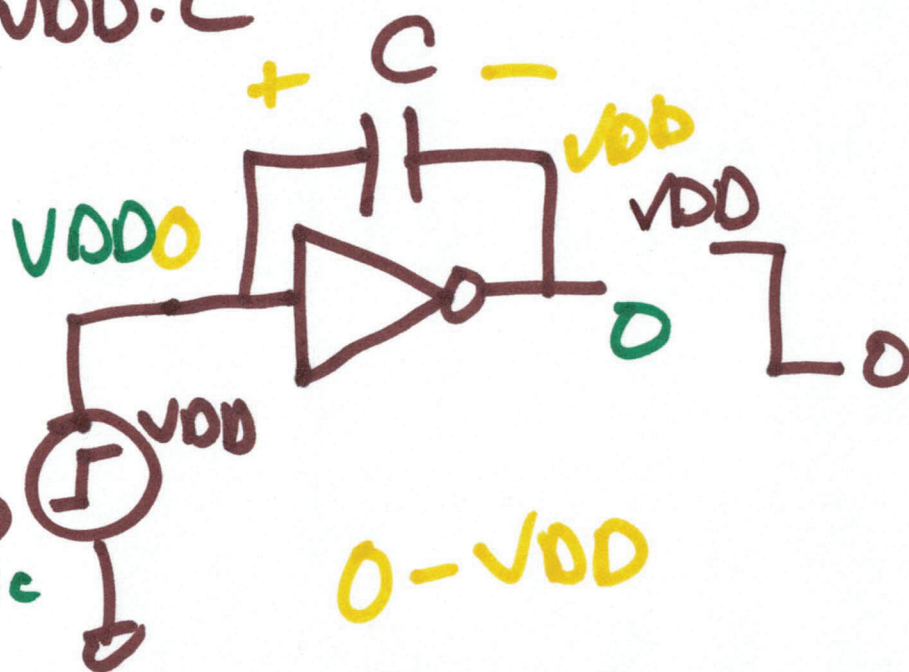
$$CV = Q$$

Miller Effect



$$Q = 2V_{DD} \cdot C$$

$$Q = (-V_{DD}) \cdot C$$

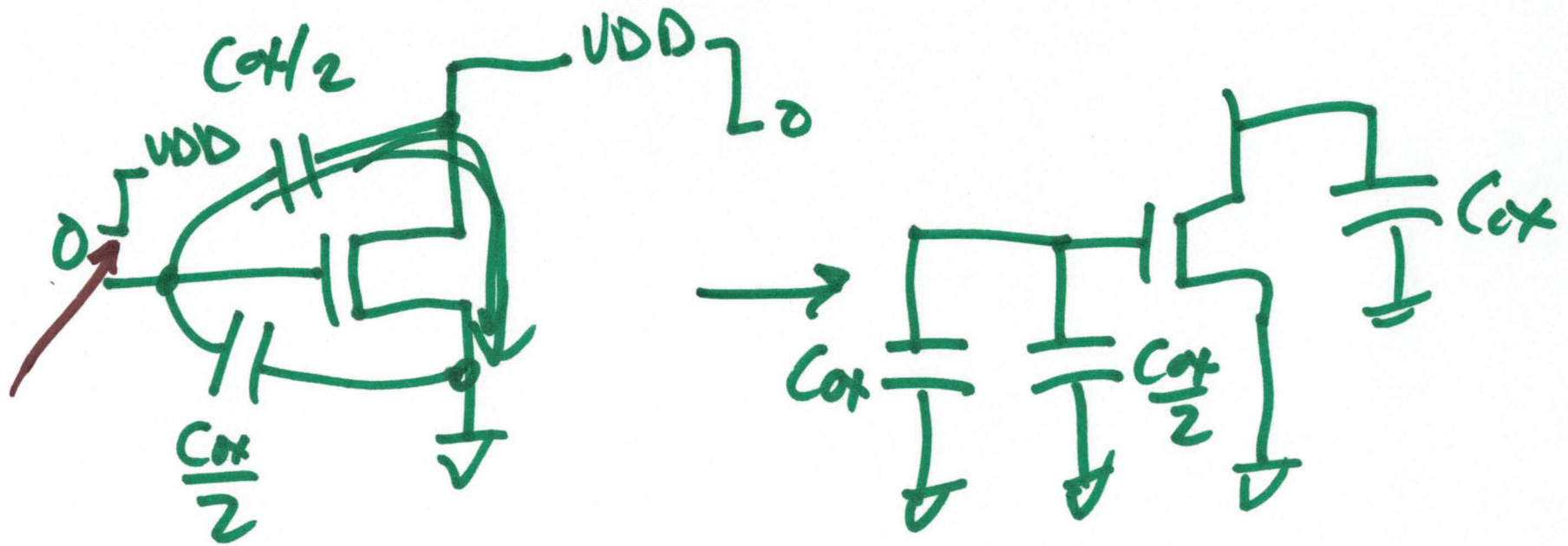


$$0 - V_{DD}$$

$$V_{DD} - 0$$

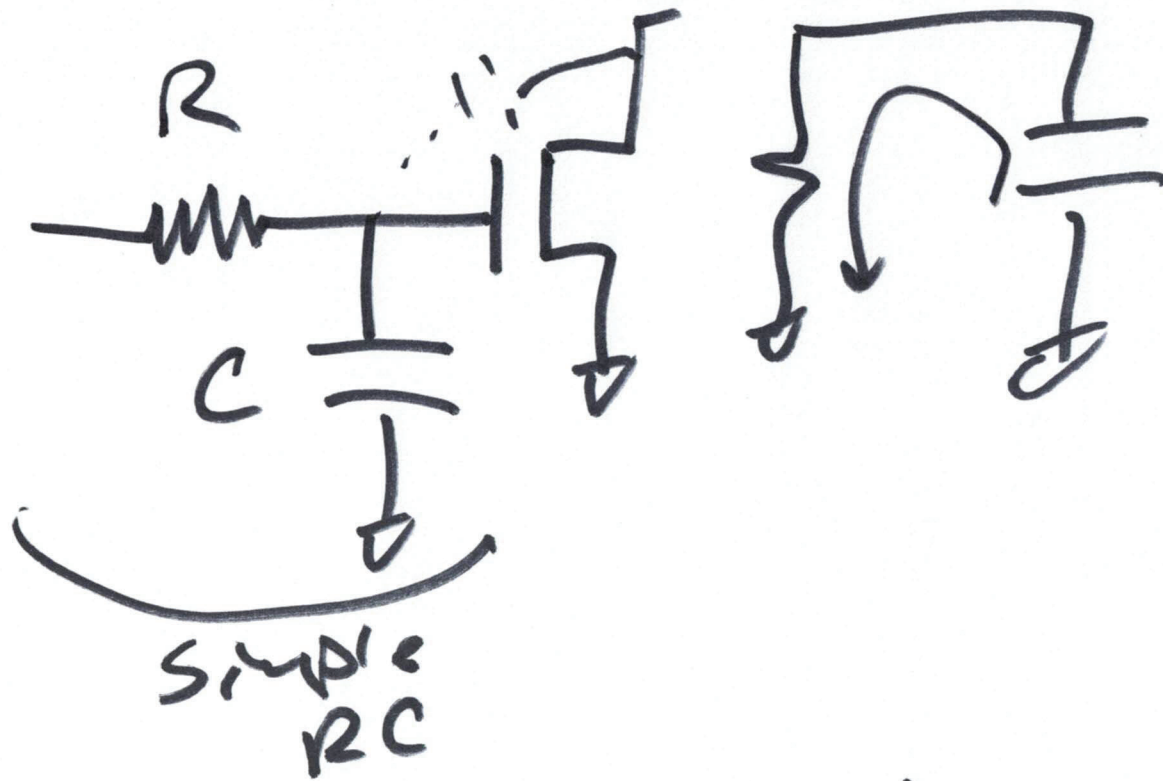
$$Q = V_{DD} \cdot C$$

3)



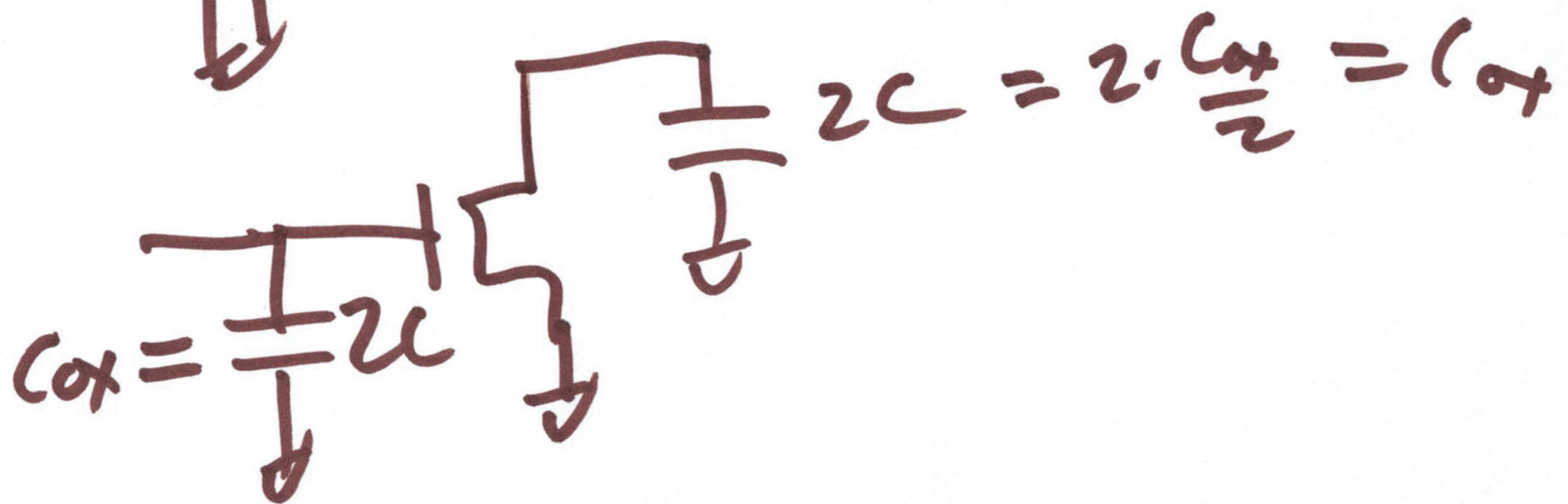
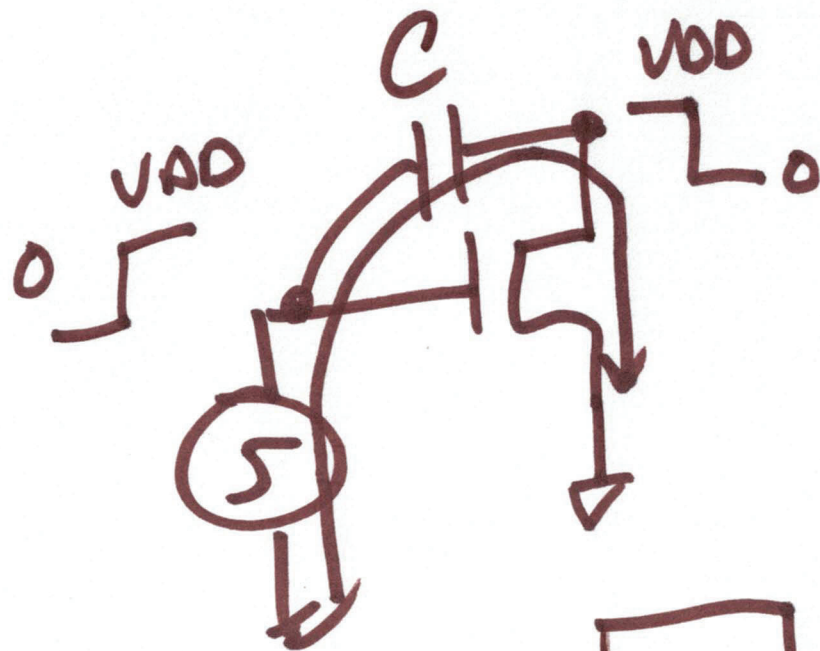
$$C_{ox} = C_{ox}' \cdot W \cdot L = \frac{\epsilon_{ox}}{t_{ox}} \cdot W \cdot L$$

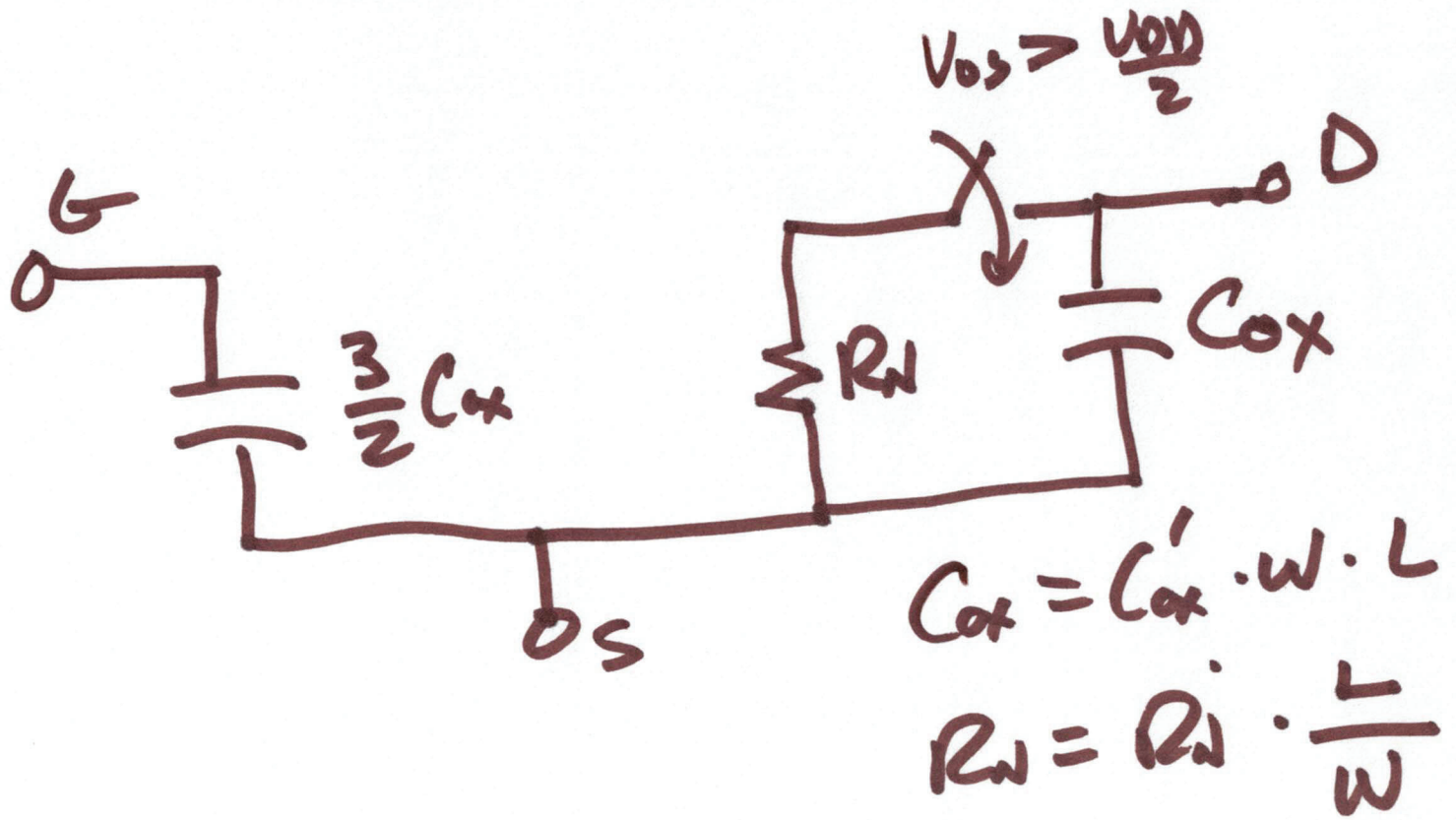
4)



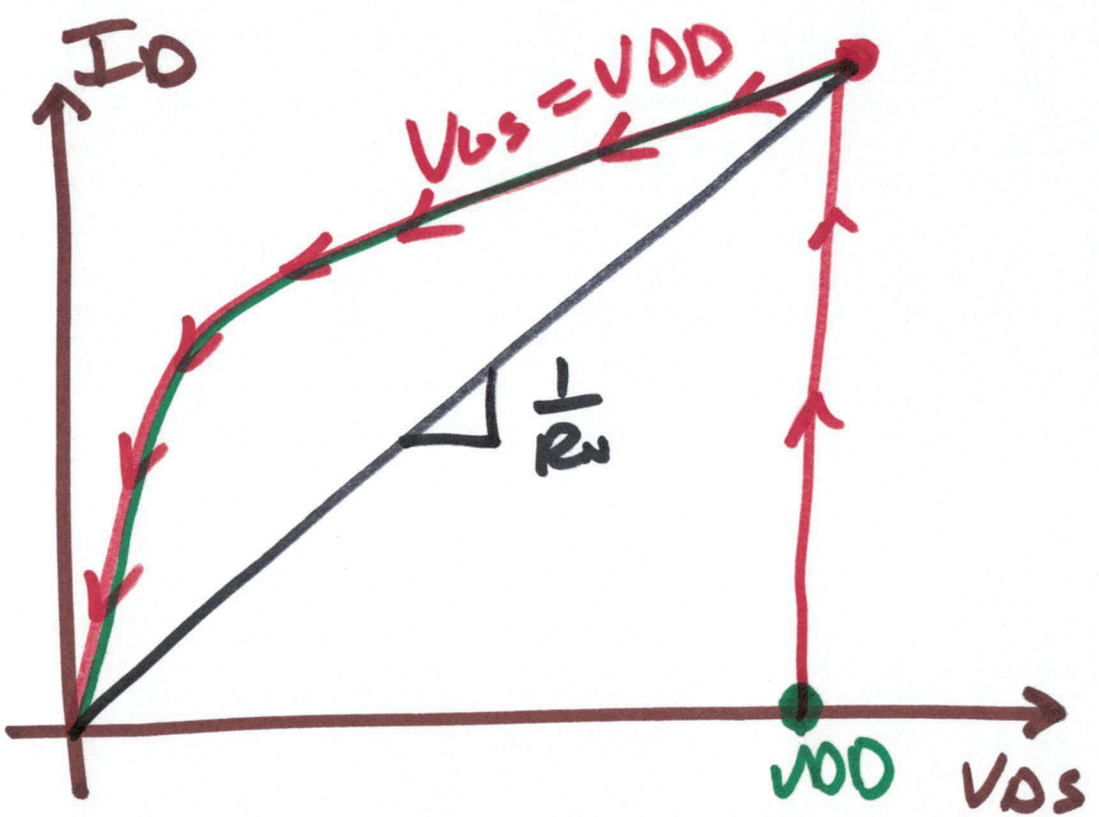
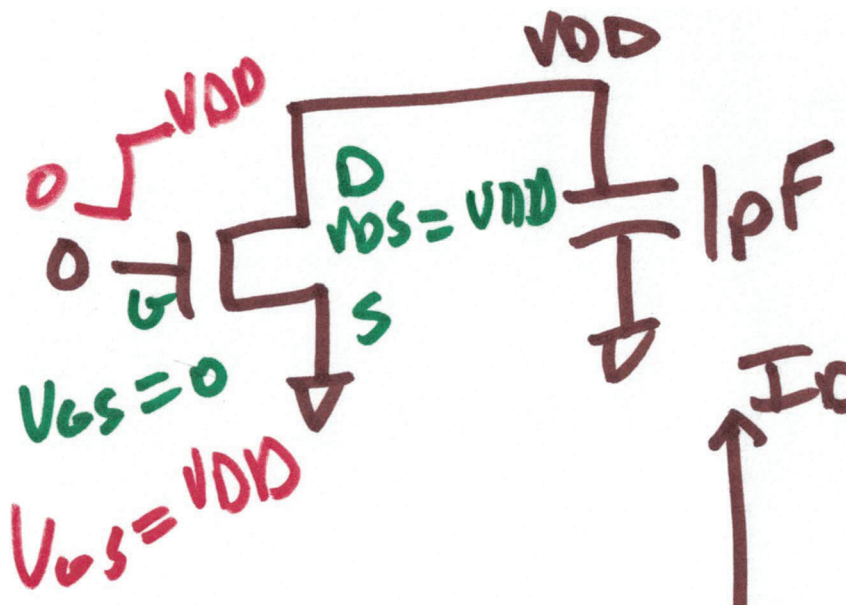
$$t_{\text{delay}} = 0.7 RC \leftarrow$$

5)

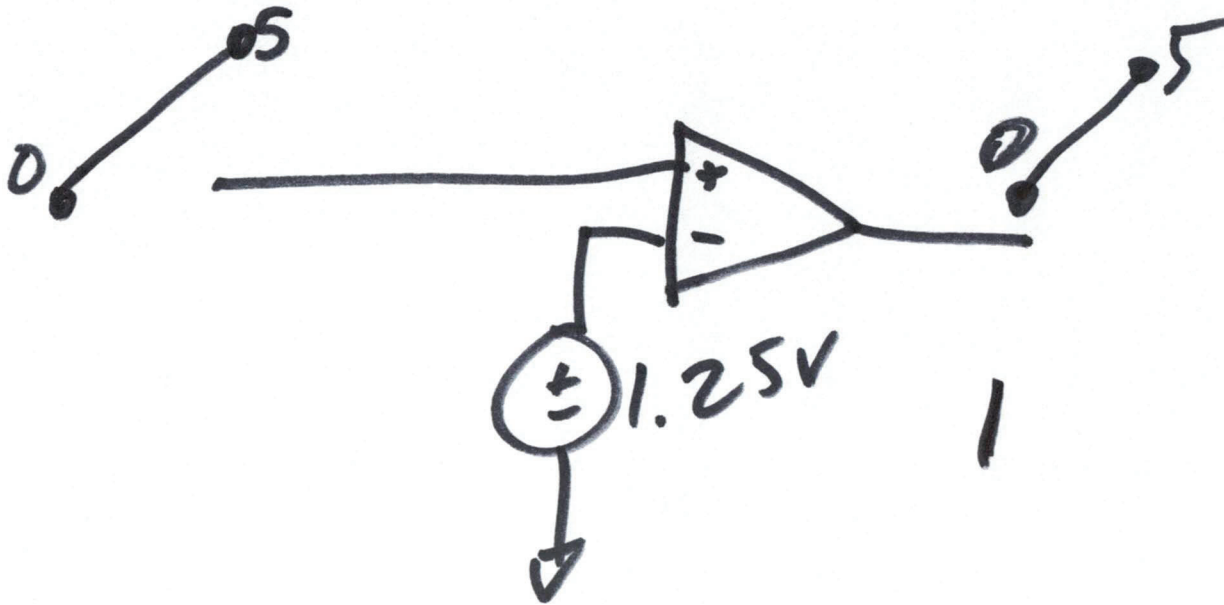




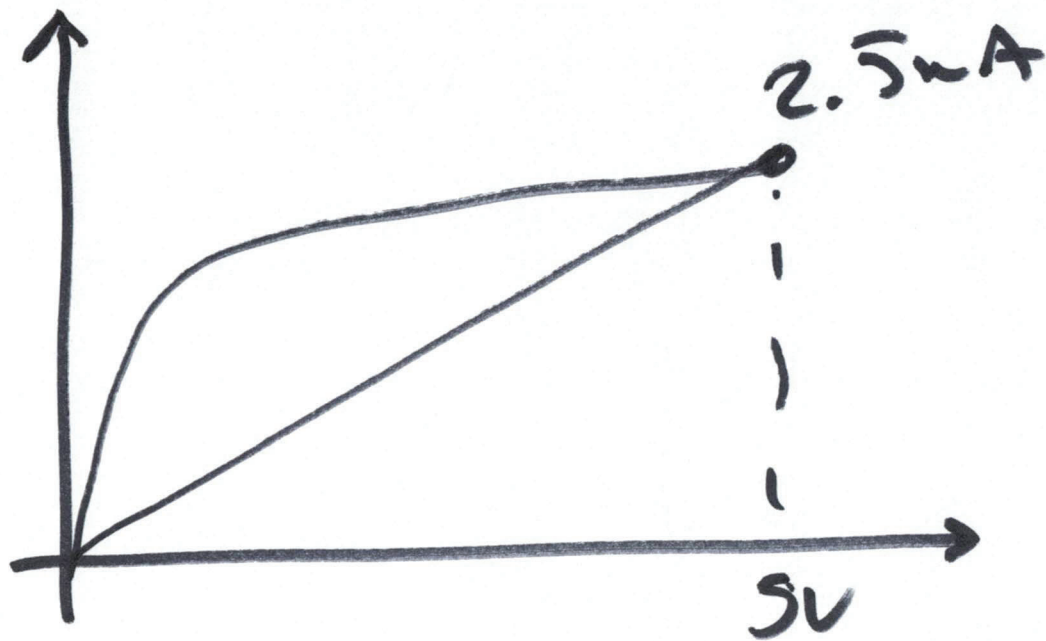
11



8)



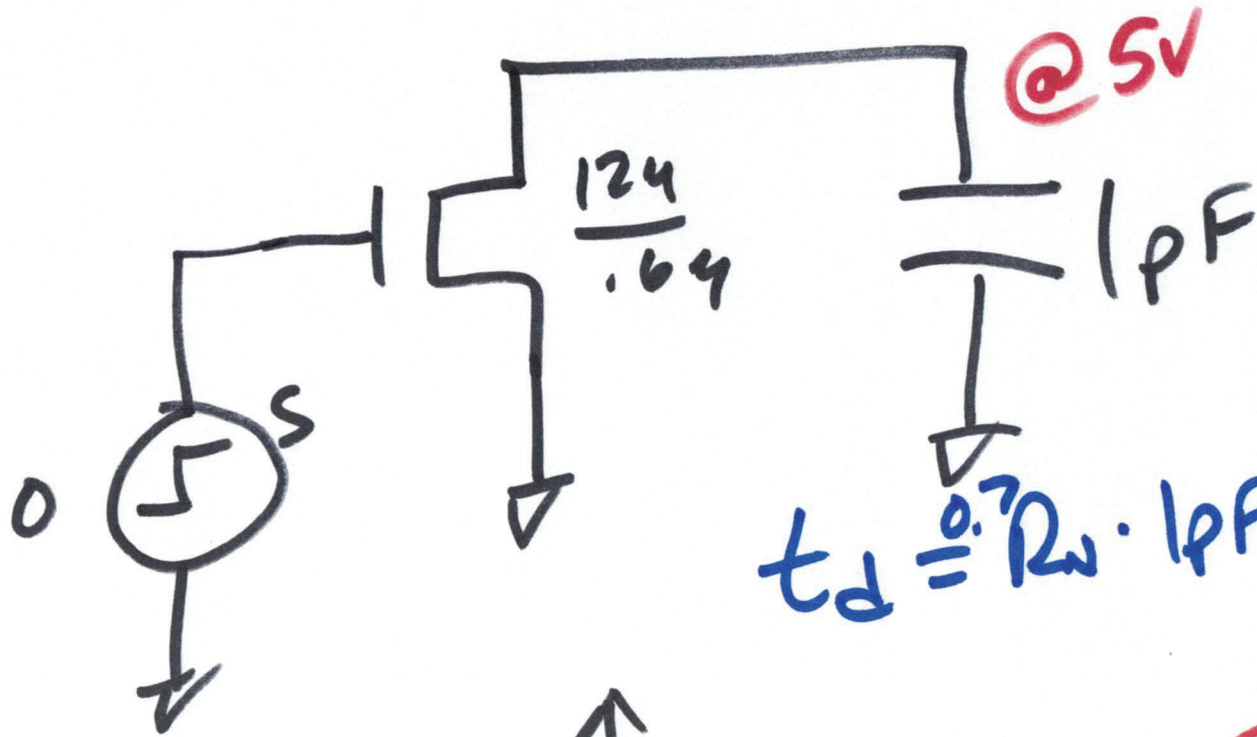
9)



$$R_N = \frac{5}{2.5 \mu A} = 2K = R_N' \cdot \frac{4}{6} \cdot 6$$

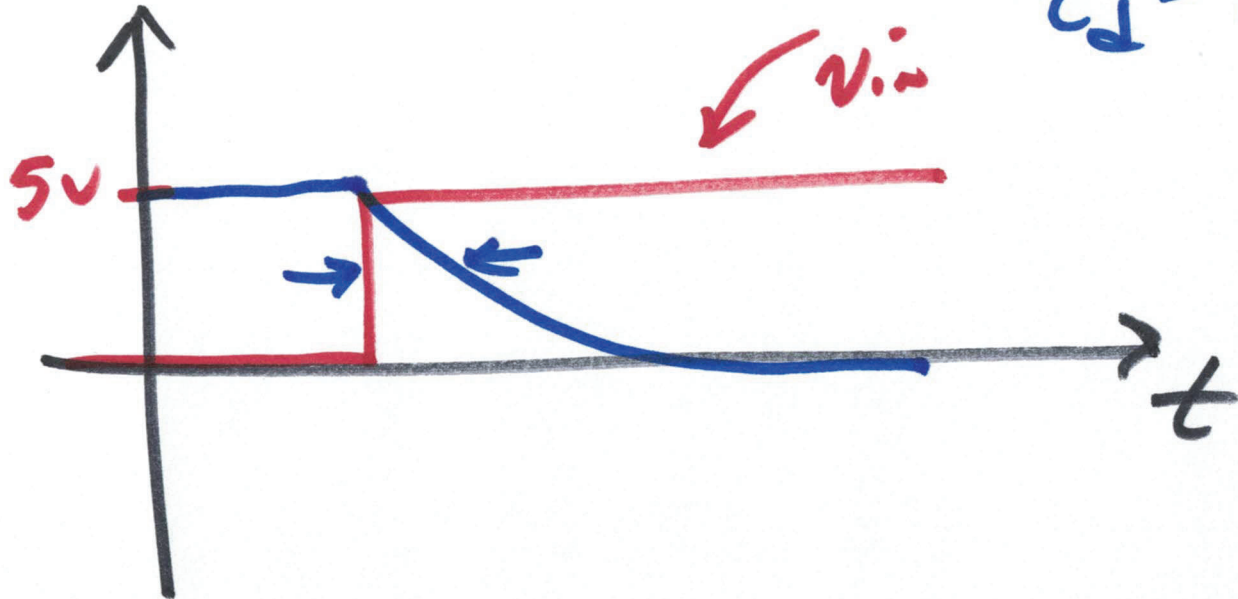
$$R_N' = 20K$$

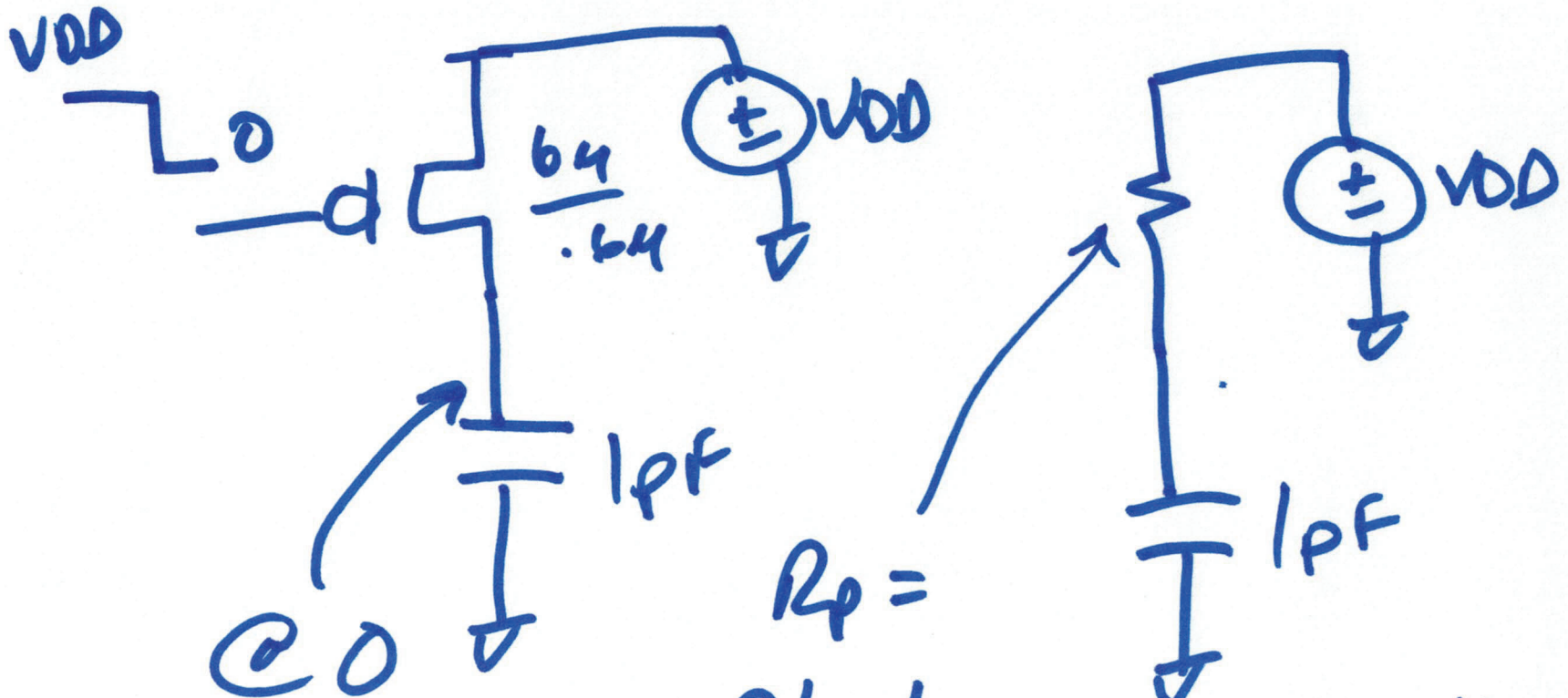
10)



$$t_d = 0.7 R_{eq} \cdot C = 0.7 \cdot \frac{20k \cdot \frac{6}{12}}{1k} \cdot 1p$$

$$t_d = 700ps$$





$$R_p = R_p' \cdot \frac{L}{W} = \tau = 4 \text{ ns}$$

$$40 \text{ k} \cdot \frac{6}{6} = 4 \text{ k}$$

$$t_d = 0.7 \tau = 0.7 R C$$

2)