

EE 421 / ECE 621

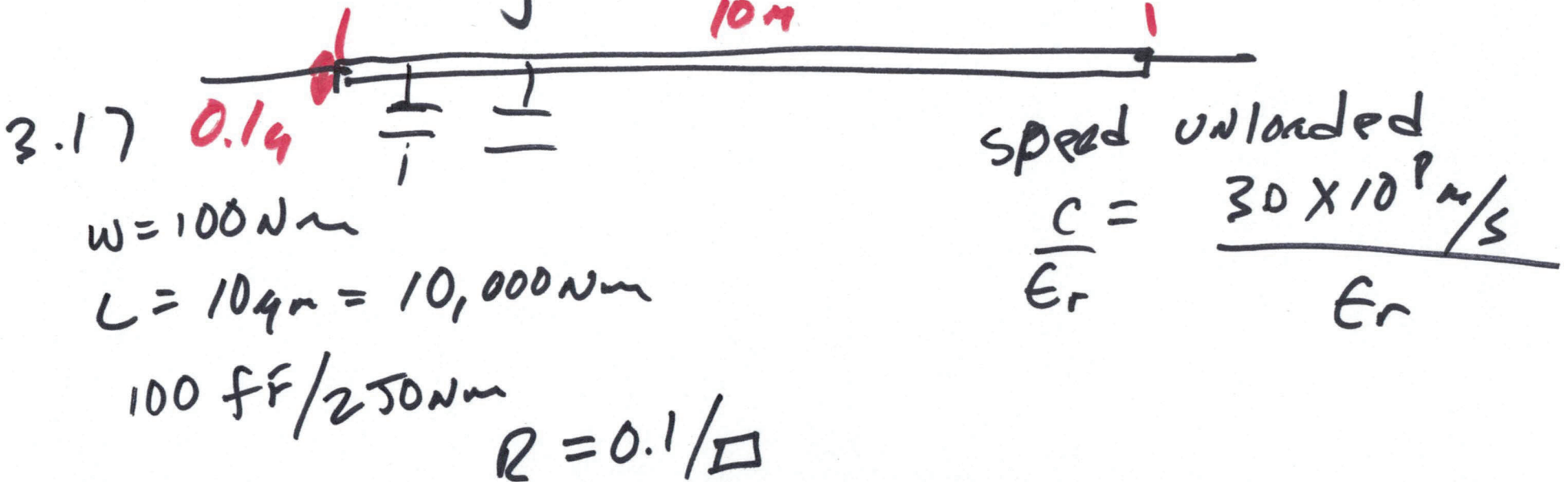
Sept. 14, 2020

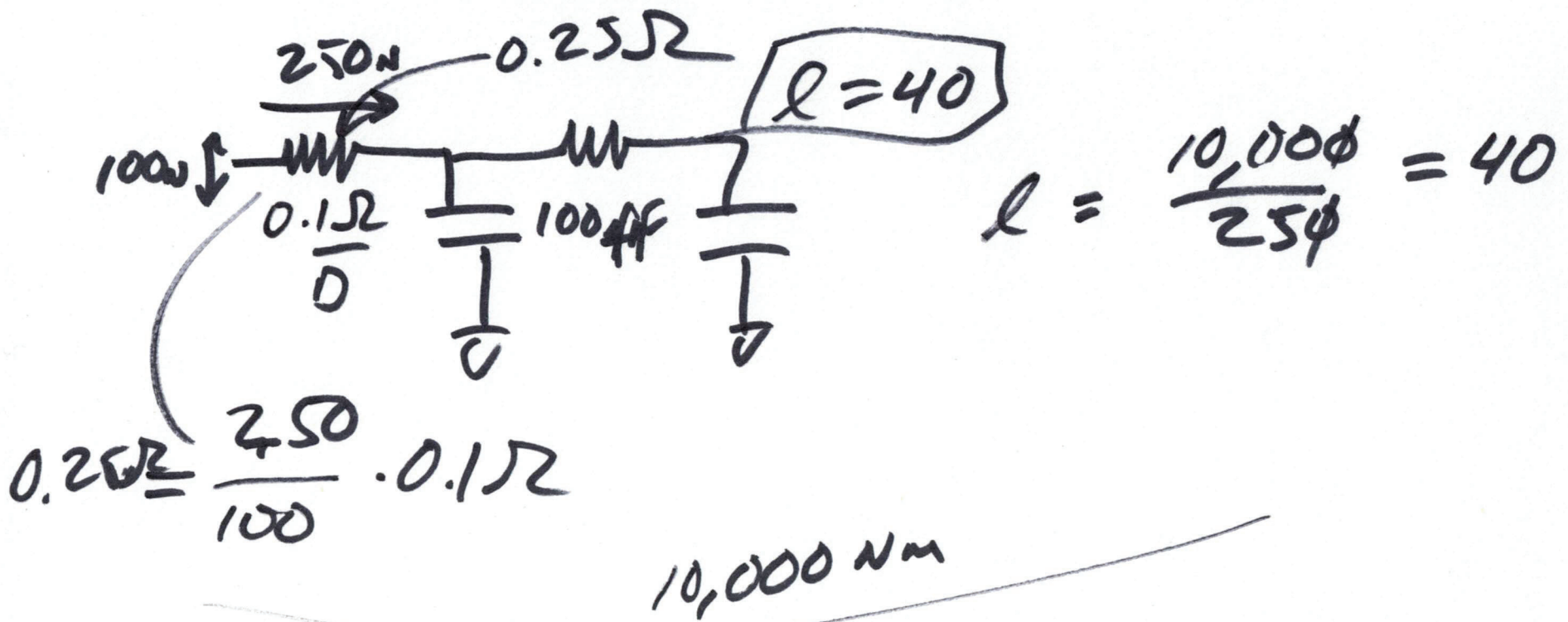
Lecture 6



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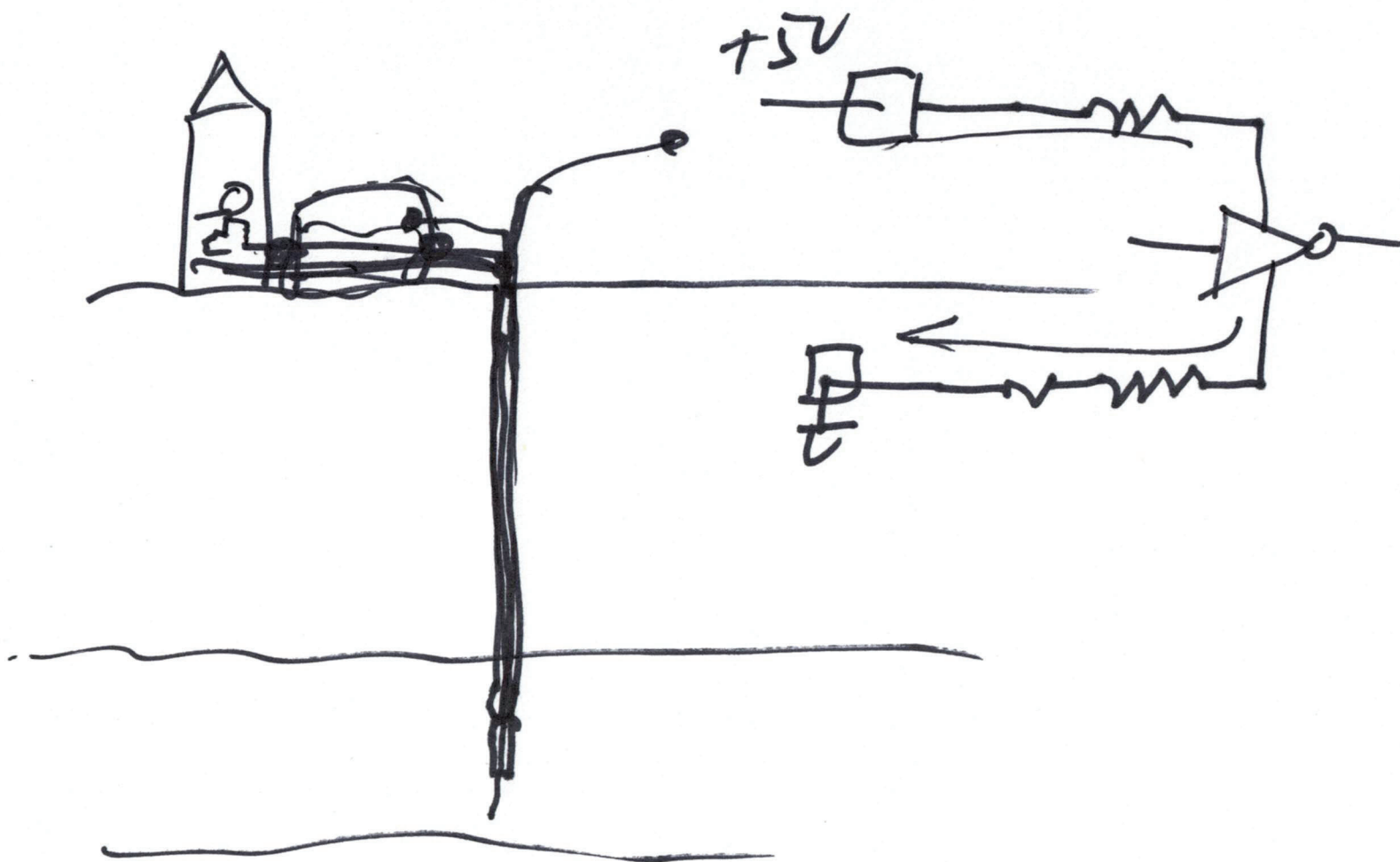
Digital IC Design



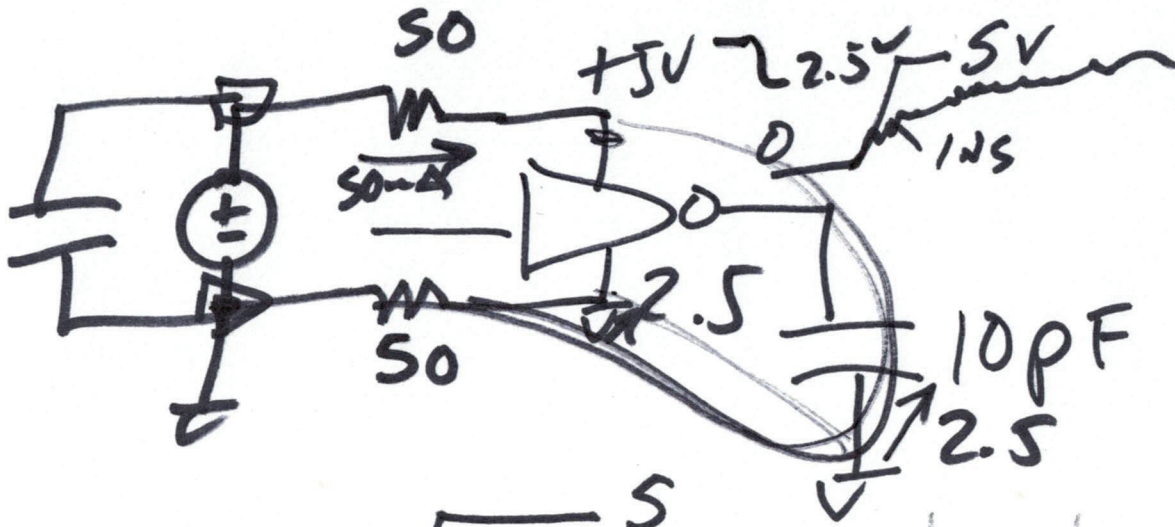


$$\begin{aligned}
 t_d &= 0.35 \cdot 0.25 \cdot 40 \cdot 100 \text{ fF} \cdot 40 \\
 &= 0.35 \cdot 10 \Omega \cdot 4 \text{ pF} \approx \underline{\underline{13.5 \text{ ps}}}
 \end{aligned}$$

2)



3)



1) How much charge do I supply to the CAP?

$$C V = Q$$

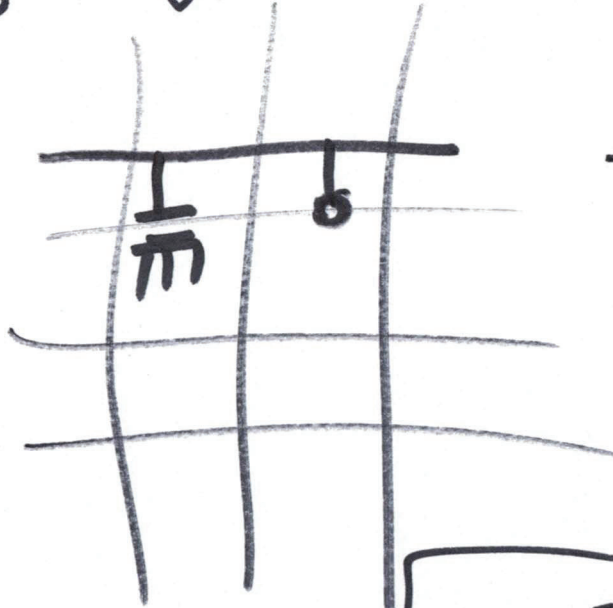
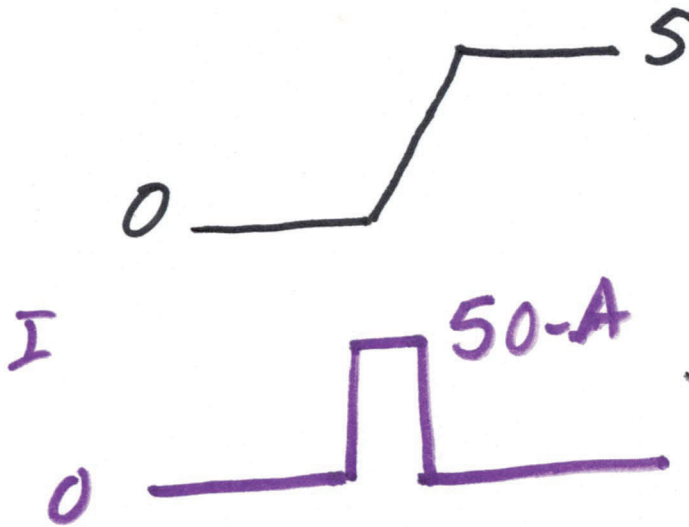
$$Q = 10 \text{ pF} \cdot 5 \text{ V} = \underline{\underline{50 \text{ pC}}}$$

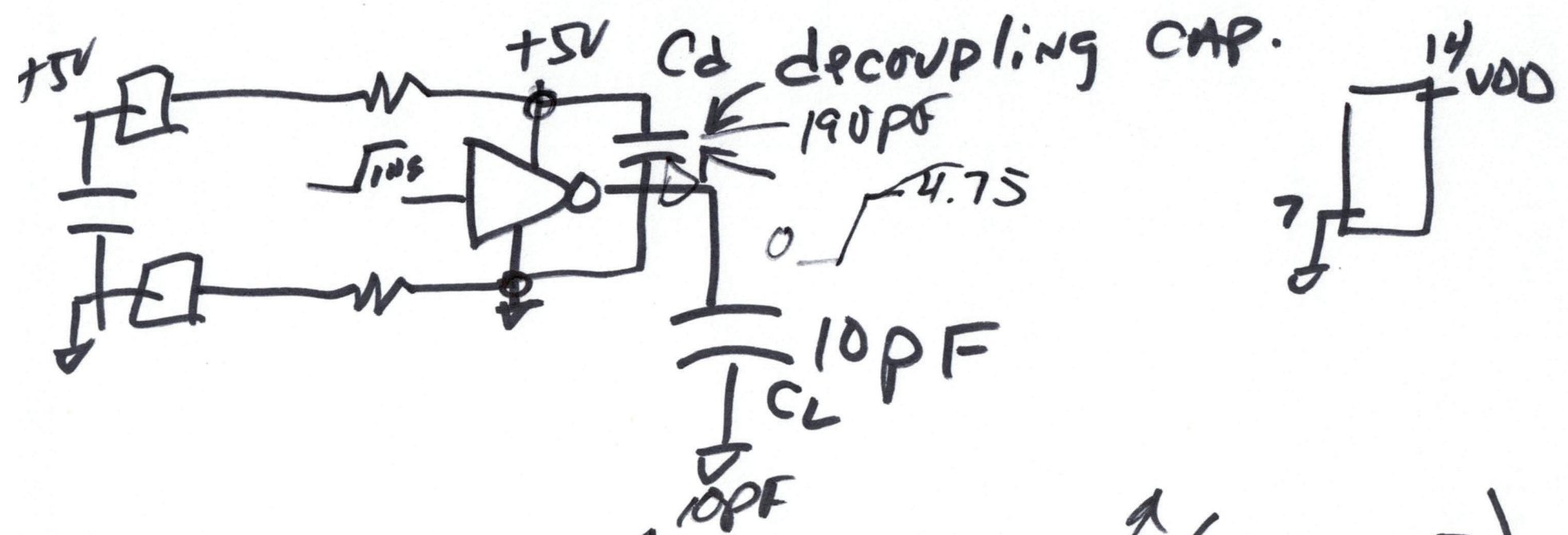
$$I = C \cdot \frac{dV}{dt}$$

$$= 10 \text{ pF} \cdot \frac{\Delta V}{\Delta t}$$

$$= 10 \text{ pF} \cdot \frac{5}{1 \text{ ns}}$$

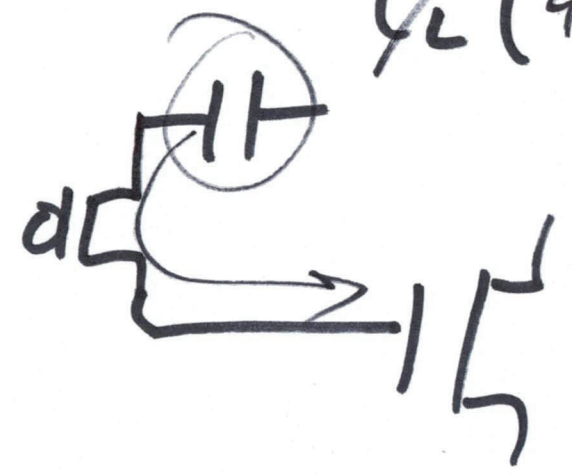
$$I = 50 \text{ mA}$$

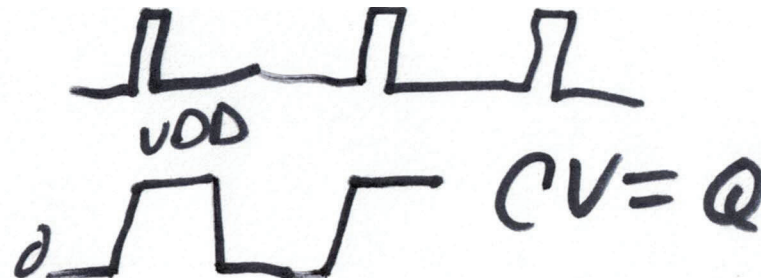
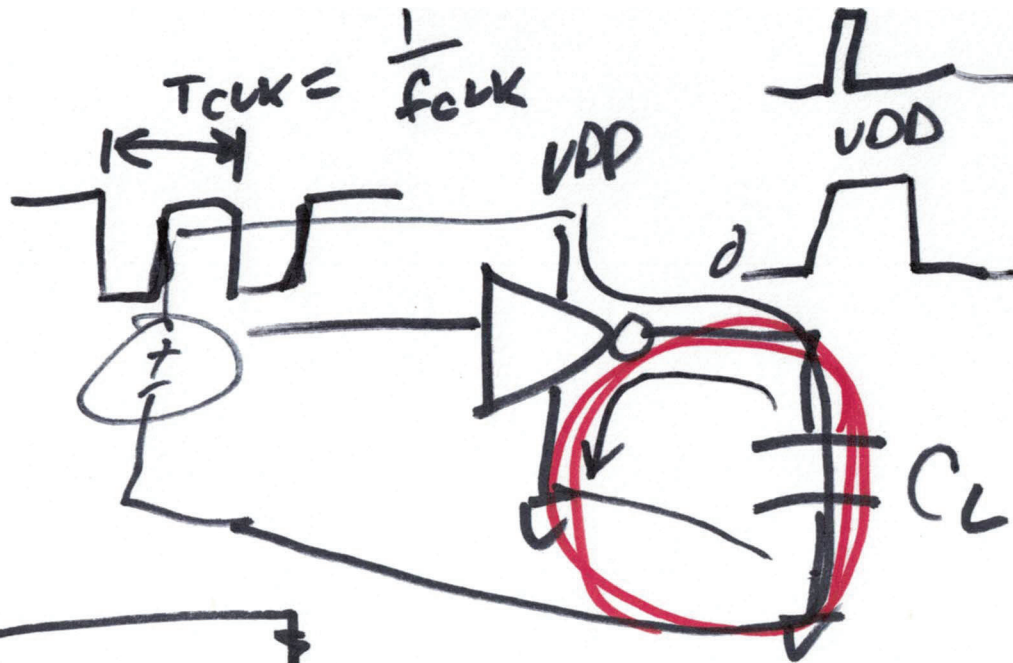




$$C_L (4.75 - 0) = C_d (5 - 4.75)$$

$$C_d = 10\text{pF} \cdot \frac{4.75}{0.25} = 190\text{pF}$$





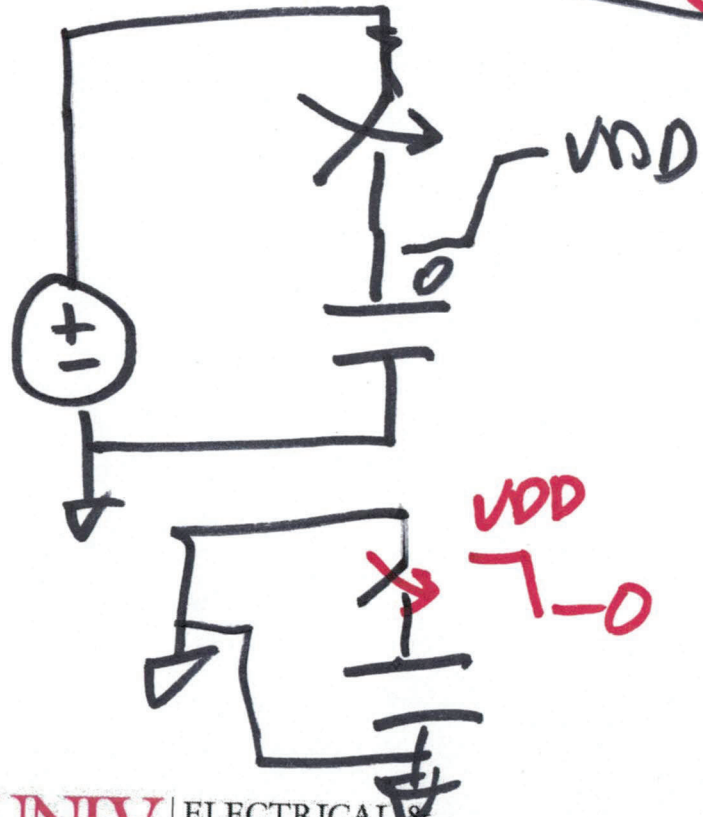
$$C_L \cdot V_{DD} = Q$$

$$I_{AVG} = \frac{Q}{T_{CLK}} = \frac{C_L \cdot V_{DD}}{T_{CLK}}$$

$$I_{AVG} = C_L \cdot V_{DD} \cdot f_{CLK}$$

$$P_{AVG} = V_{DD} \cdot I_{AVG}$$

$$P_{AVG} = V_{DD}^2 \cdot C_L \cdot f_{CLK}$$



b)

GROUND BOUNCE

