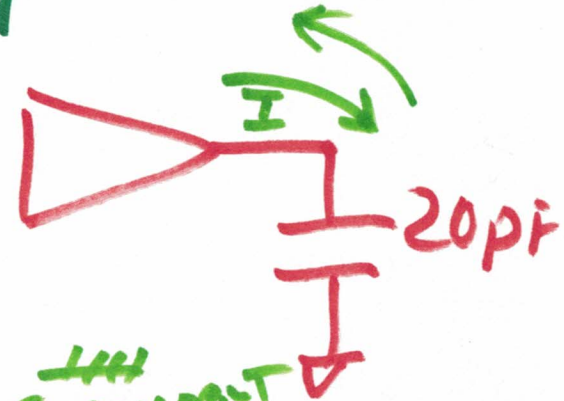
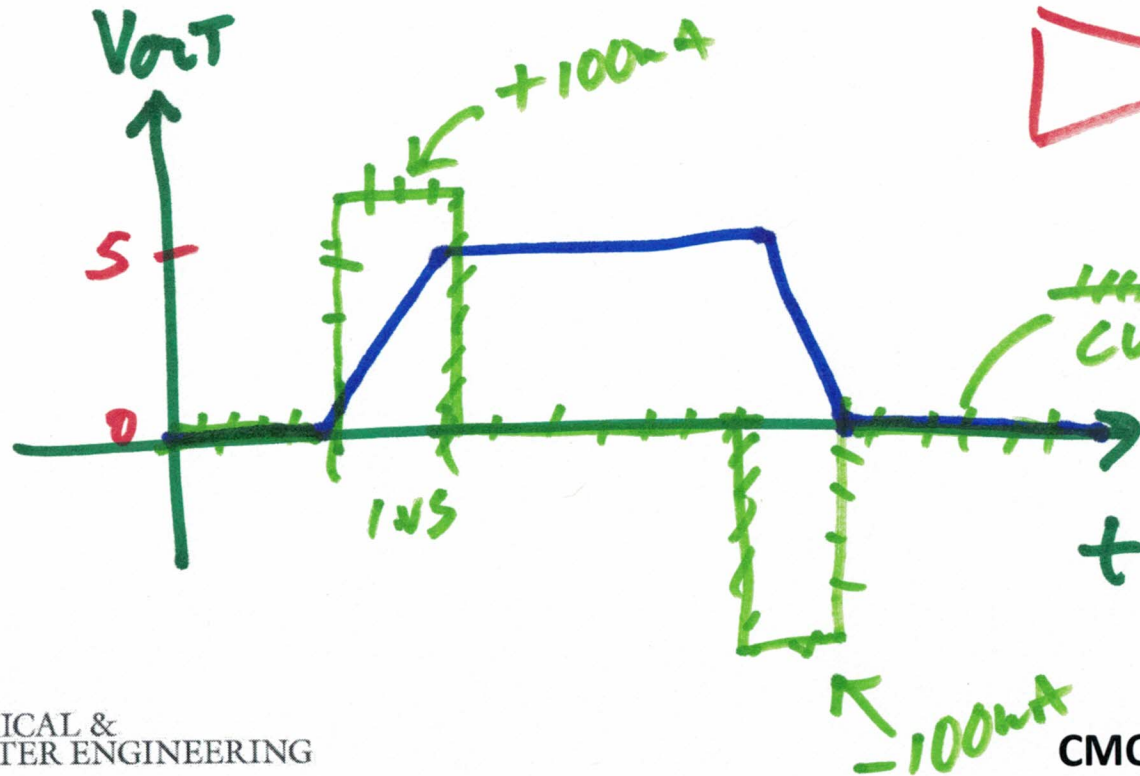


EE 421 / ECG 621

Digital IC Design $CV=Q$

OCT. 14, 2015 a) $\frac{20 \cdot 5}{100 \text{ pC}}$

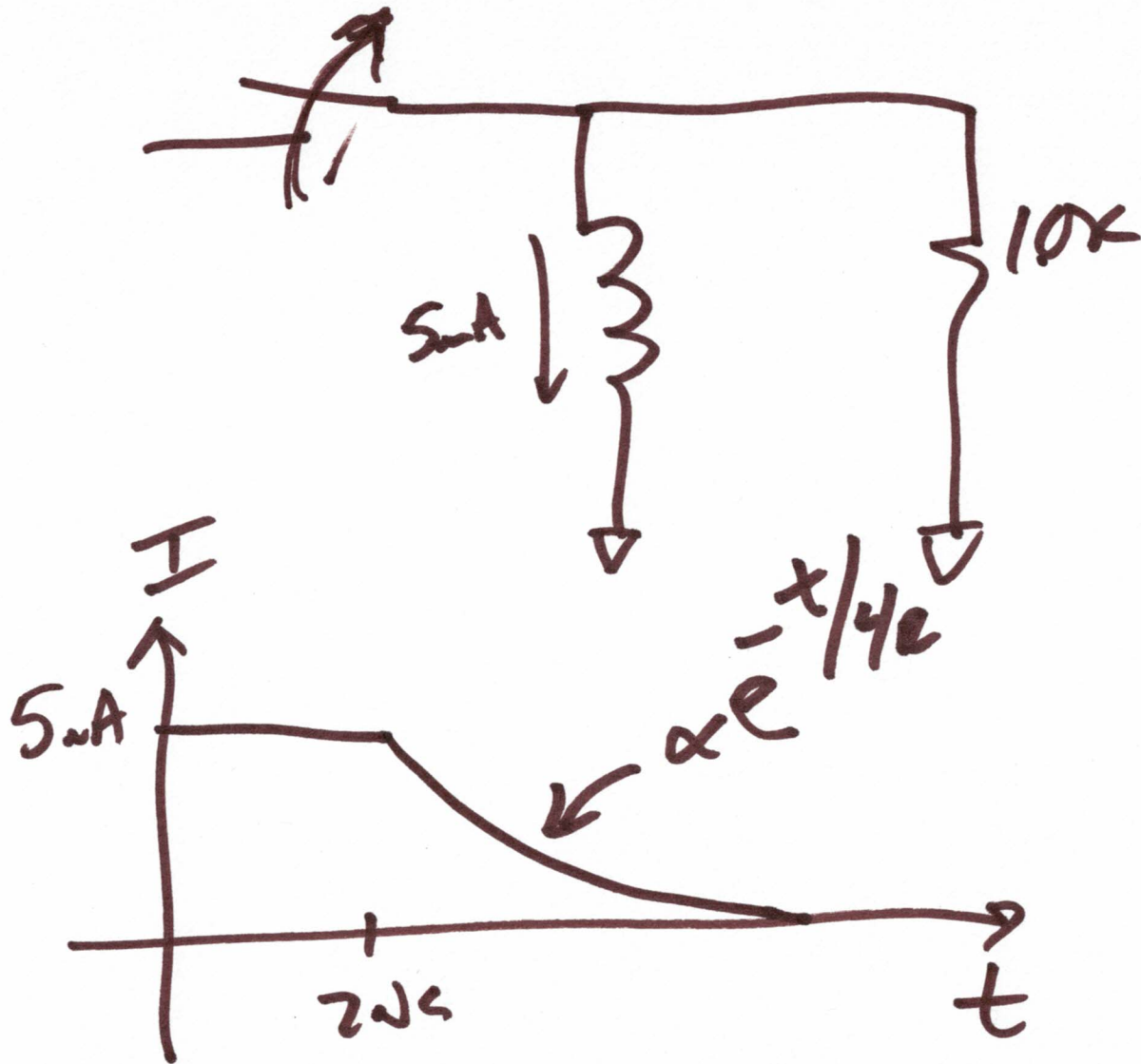
Lecture 14



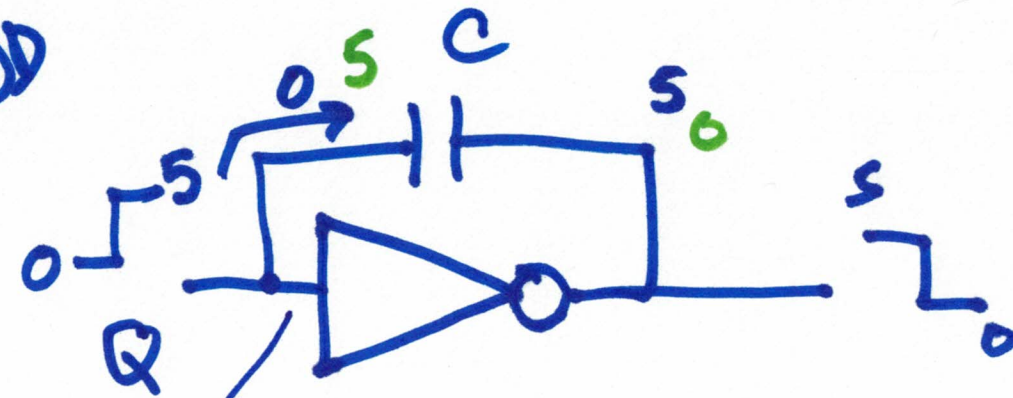
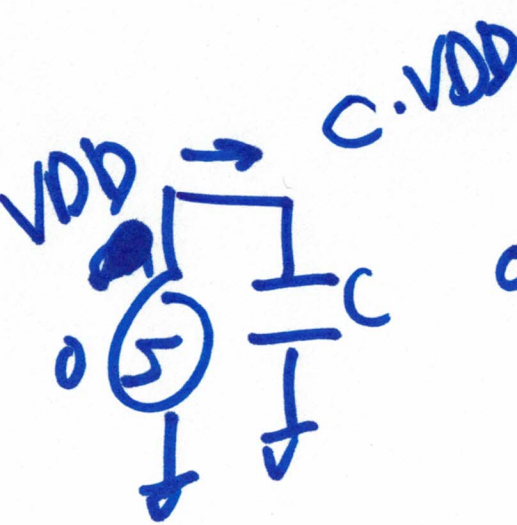
b) $I = \frac{100 \text{ pC}}{1 \text{ ns}} = \underline{\underline{100 \text{ nA}}}$

1)

1)



2)

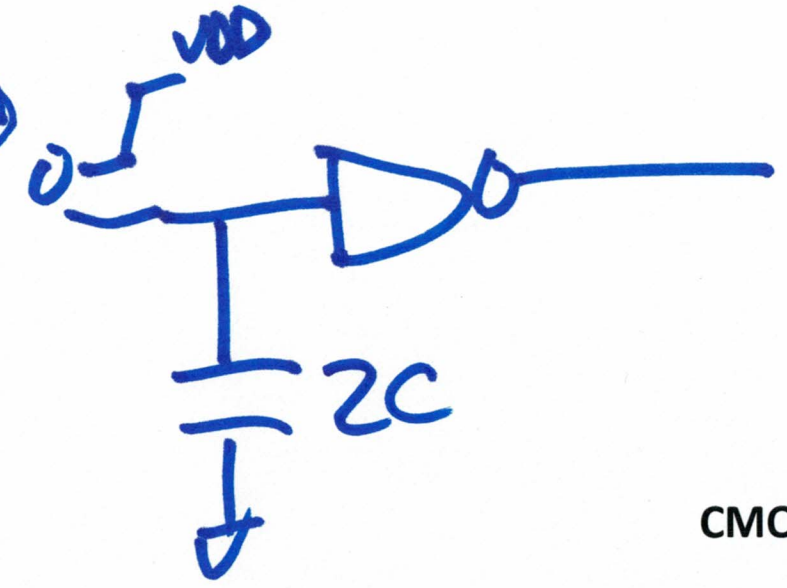


$$(0-5)C$$

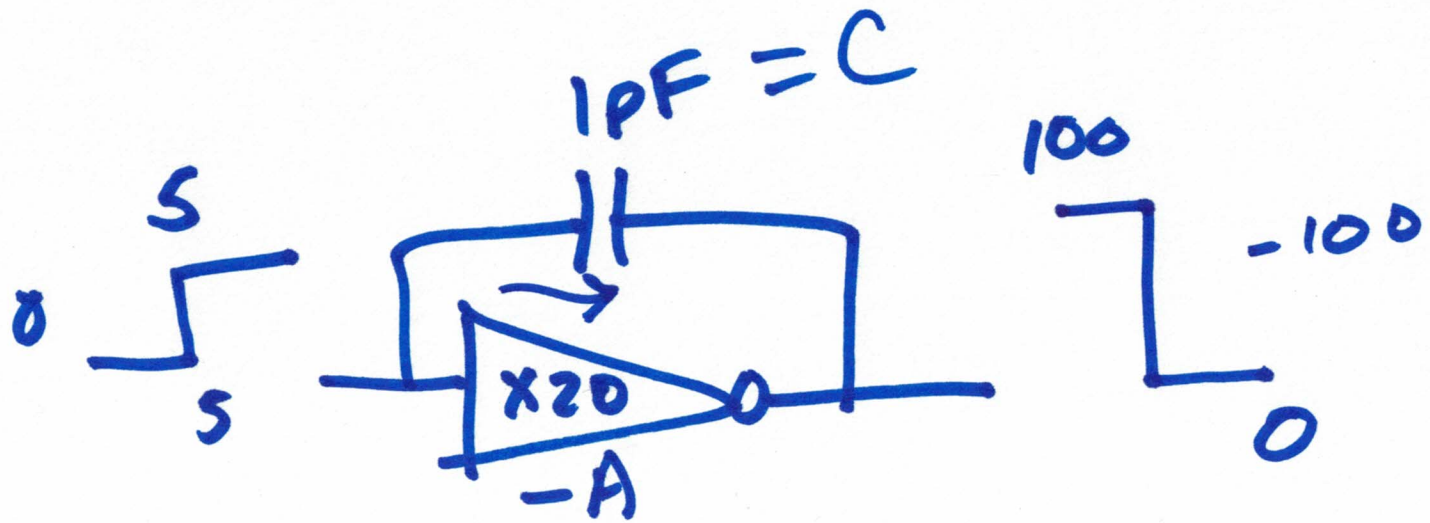
$$(5-0) \cdot C$$

Total charge supplied

$$= 5C - (-5C) = 2VDD \cdot C$$

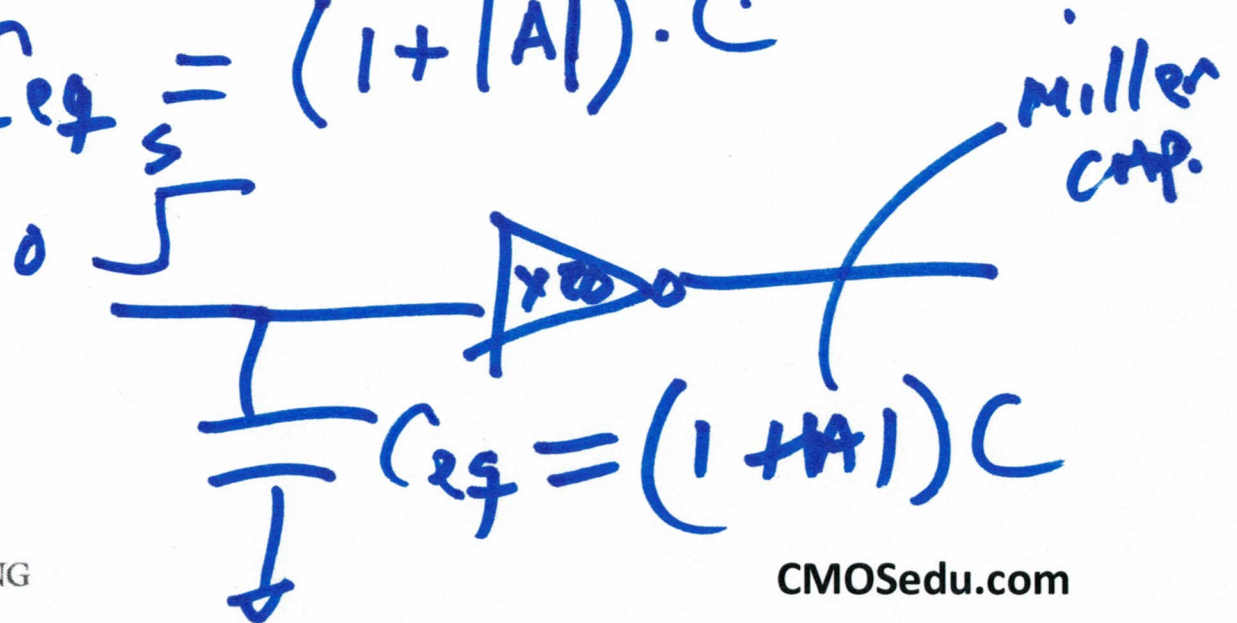


3)



$$(100 - 0) \text{IP} - (0 - 5) \text{IP}$$

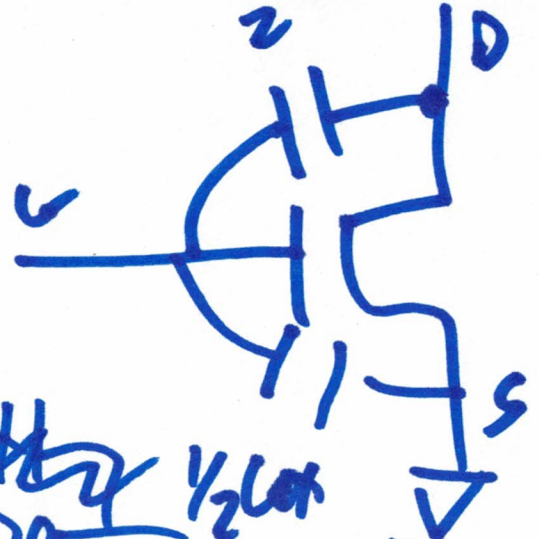
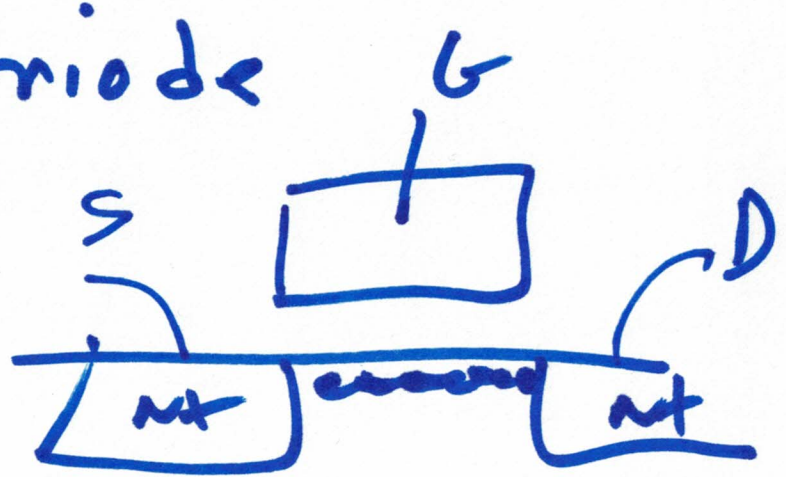
$$C_{eq} = (1 + |A|) \cdot C$$



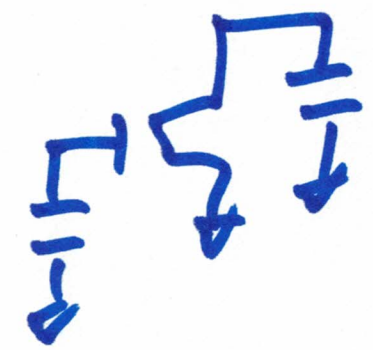
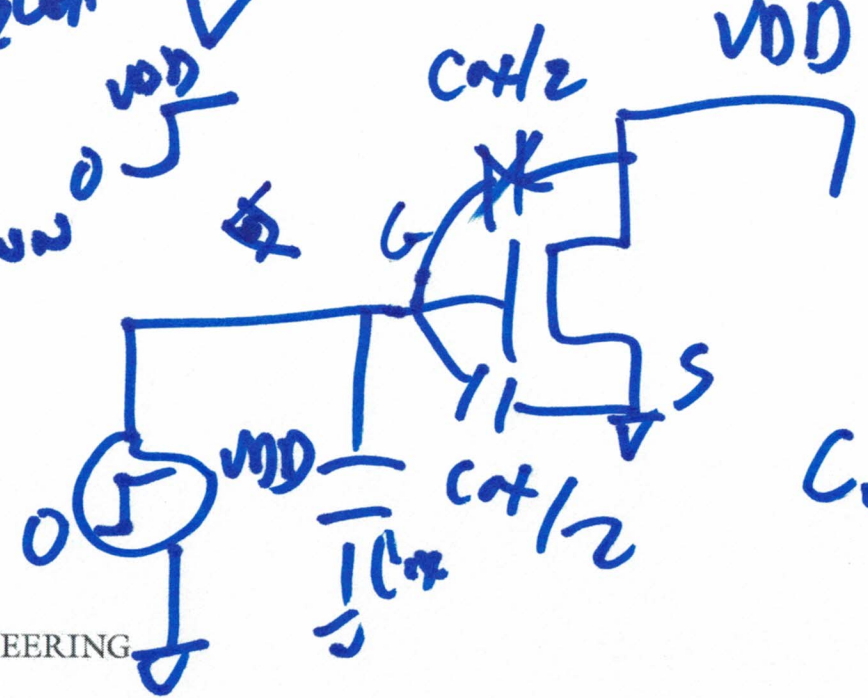
4)

ASSume triode

$$\frac{1}{2} C_{ox} = \frac{1}{2} C_{ox} \cdot W \cdot L$$

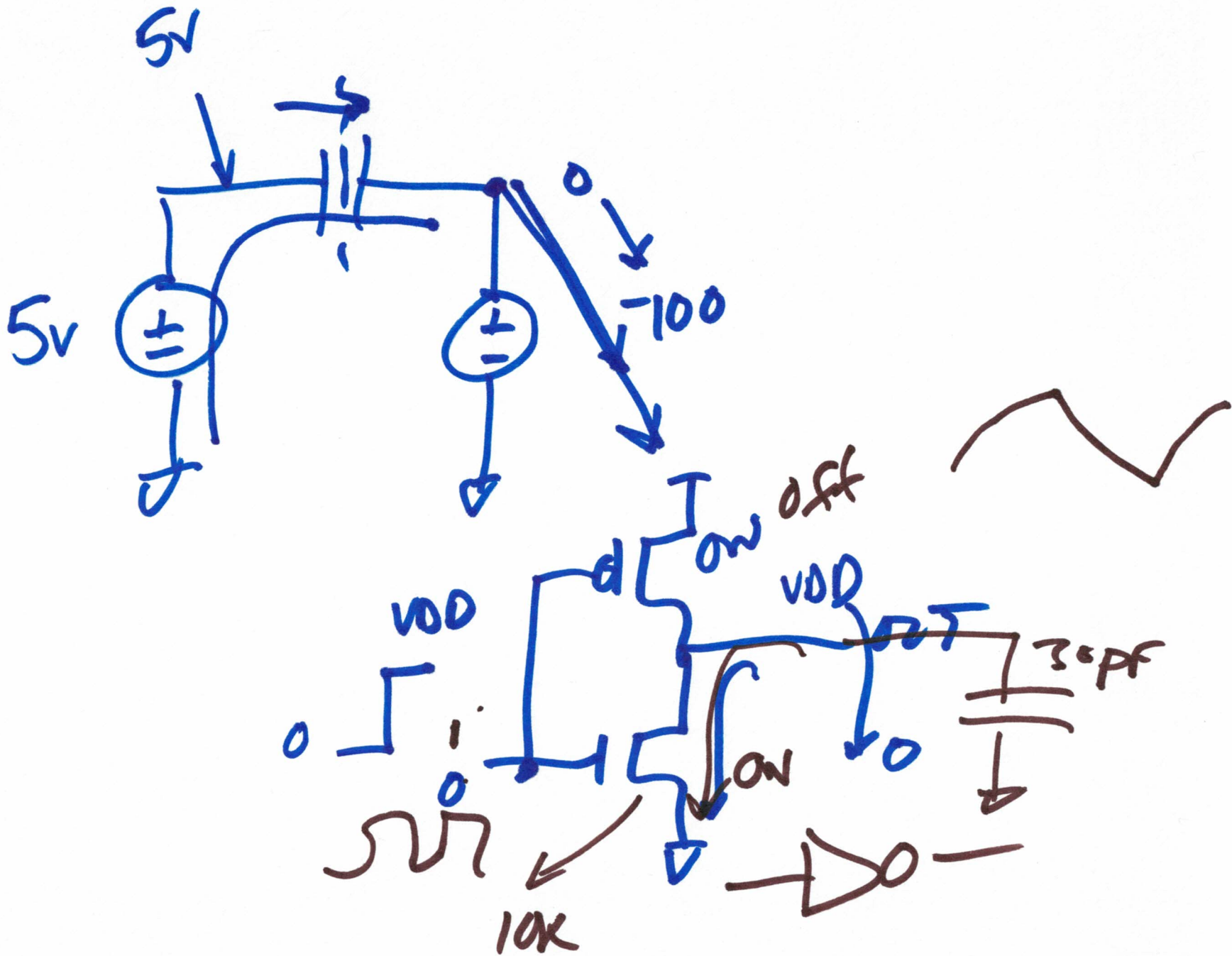


$$C_{in} = \frac{1}{2} C_{ox}$$

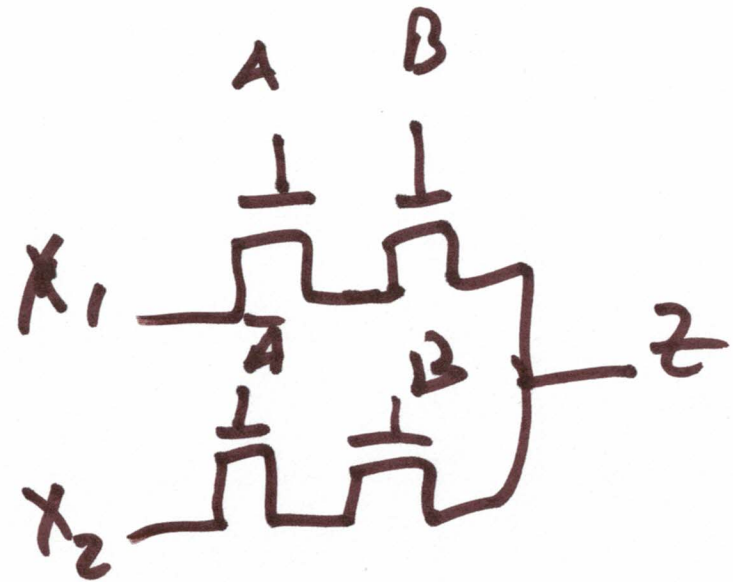
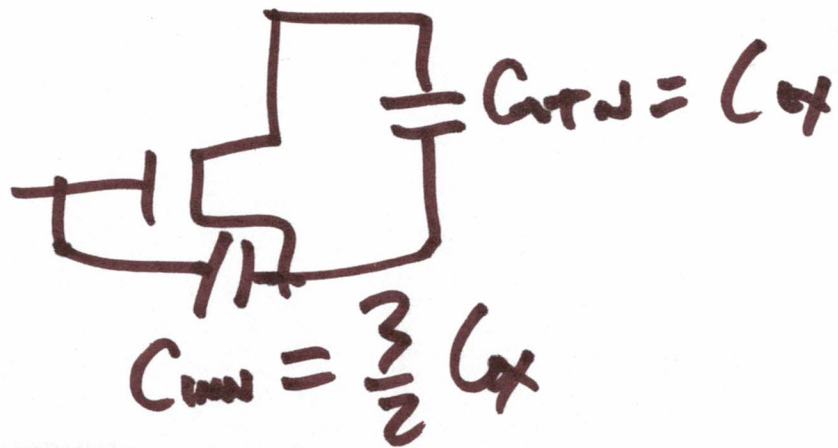
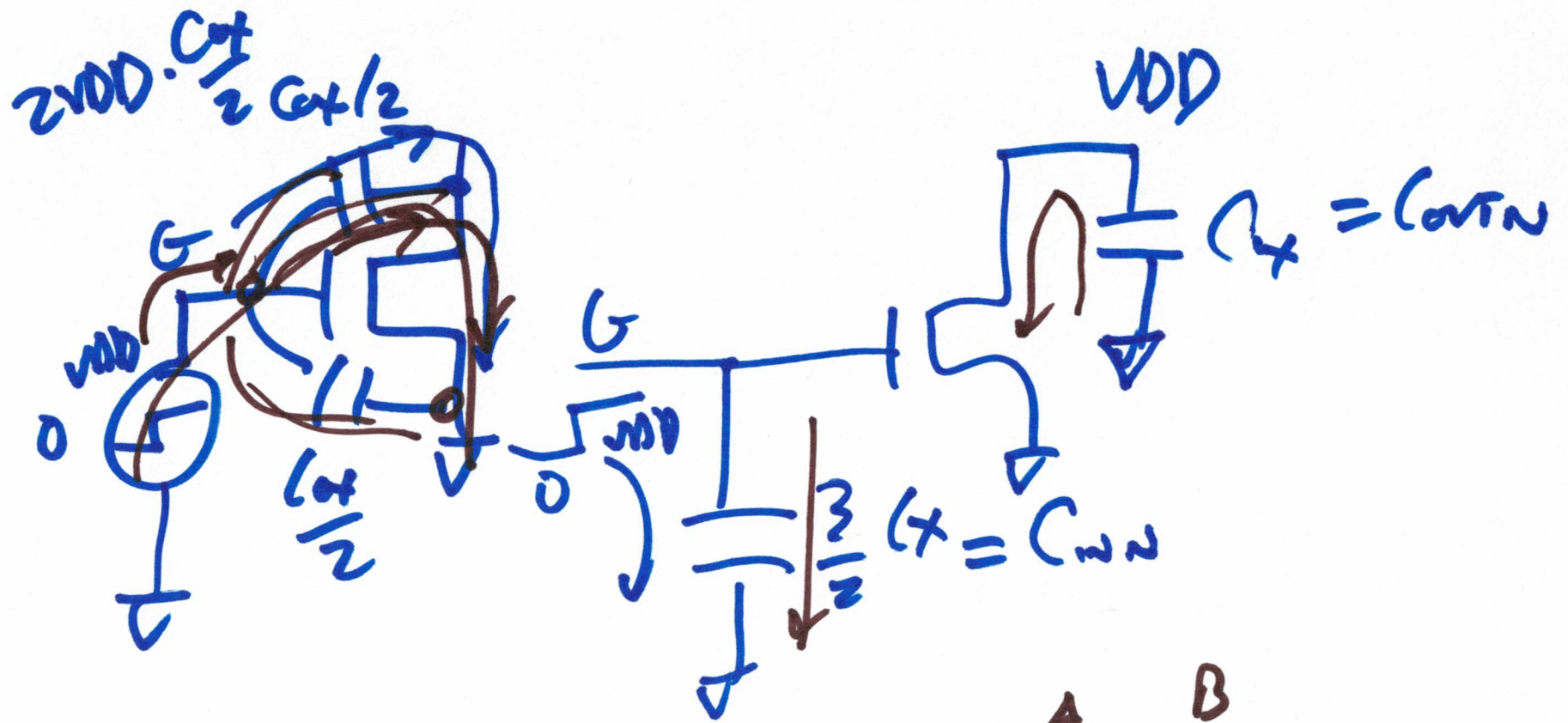


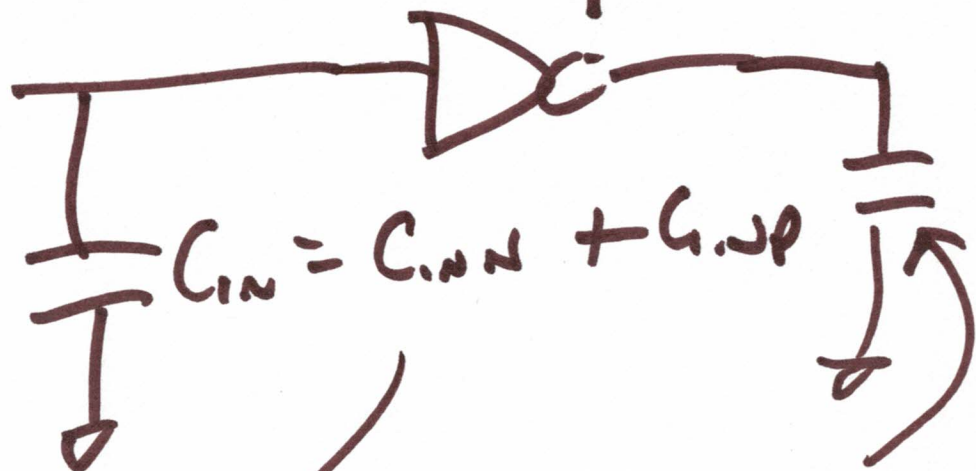
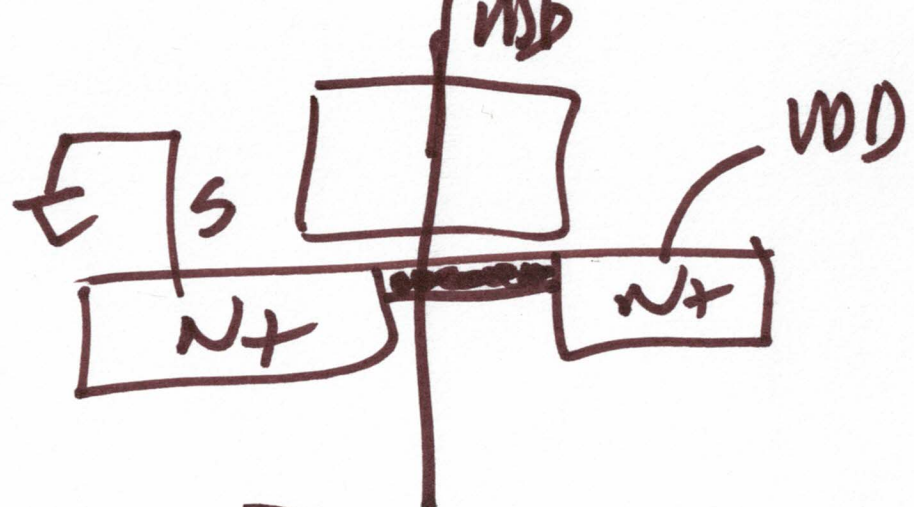
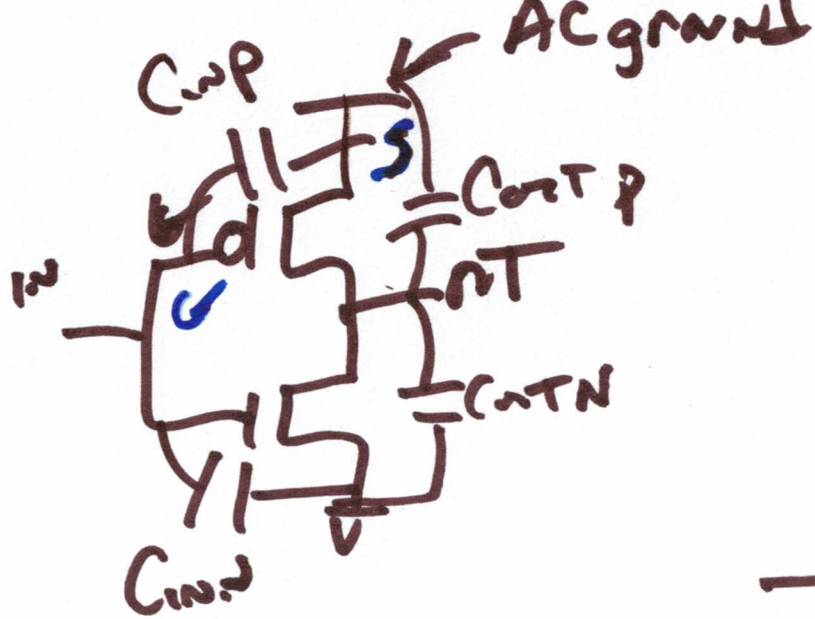
$$C_{in} = \frac{C_{ox}}{2} + C_{ox} = C_{ox} \cdot \frac{3}{2}$$

5)



6)





DO

$$C_{in} = \frac{3}{2} C_{ox}' \cdot W_N L_N$$

$$C_{ovTP} + C_{ovTN}$$

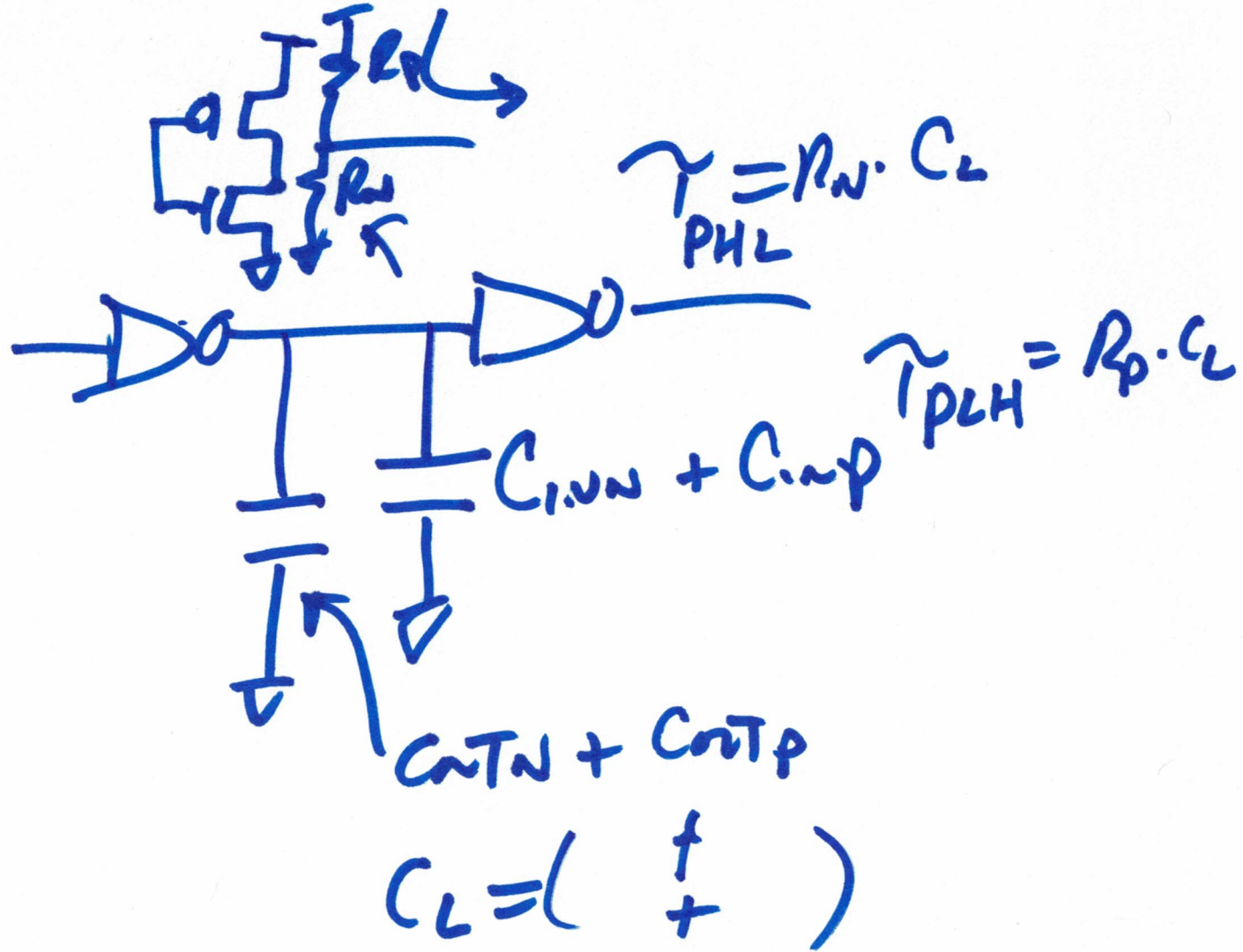
$$C_{ovTP} + C_{ovTN}$$

$$C_{in} = C_{inN} + C_{inP}$$

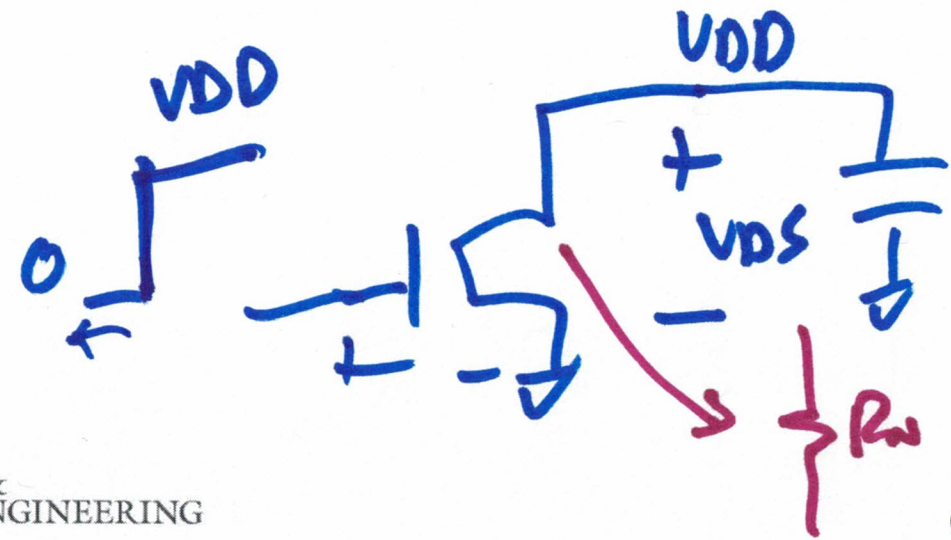
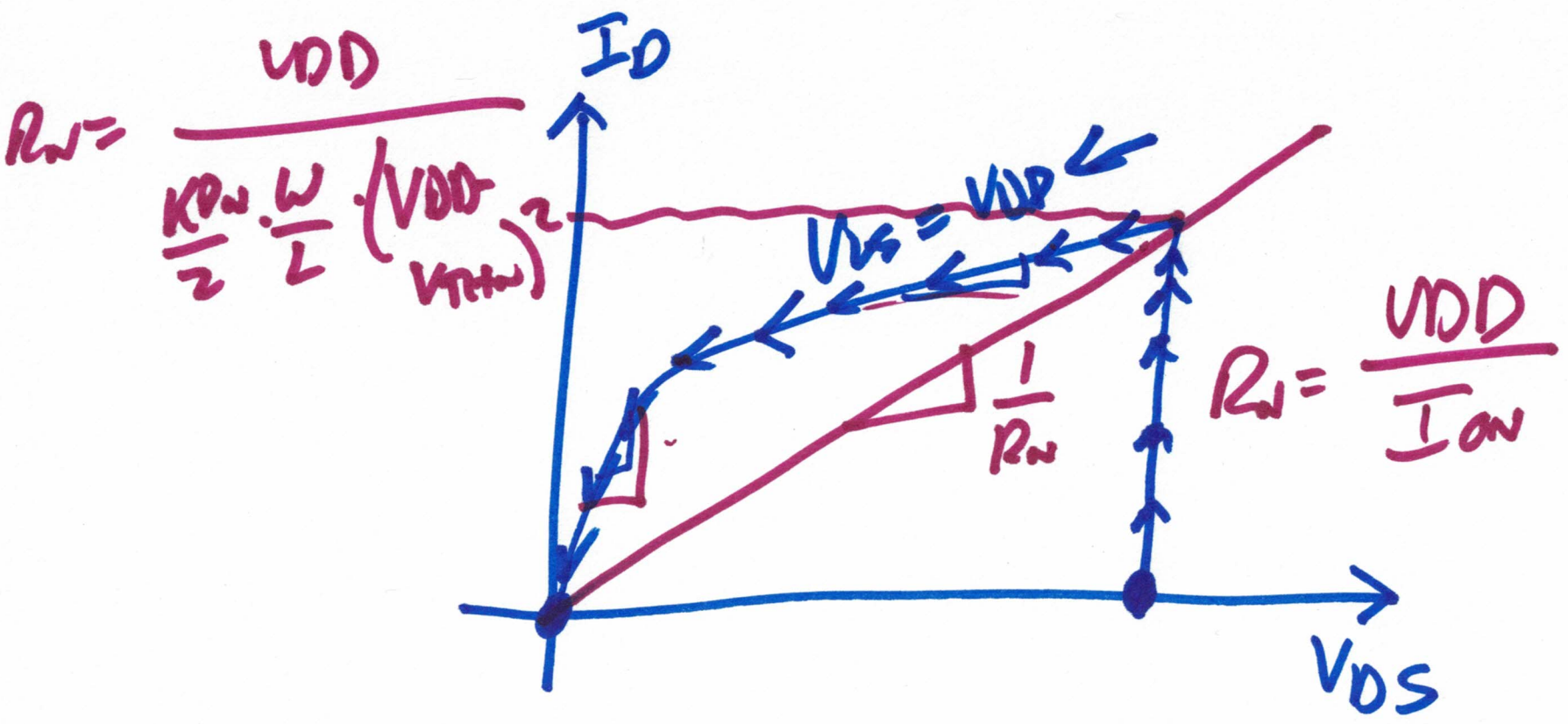
$$= \frac{3}{2} C_{ox}' \cdot W_N L_N + \frac{3}{2} C_{ox}' \cdot W_P L_P$$

$$= \frac{2}{3} C_{in}$$

8)



9)



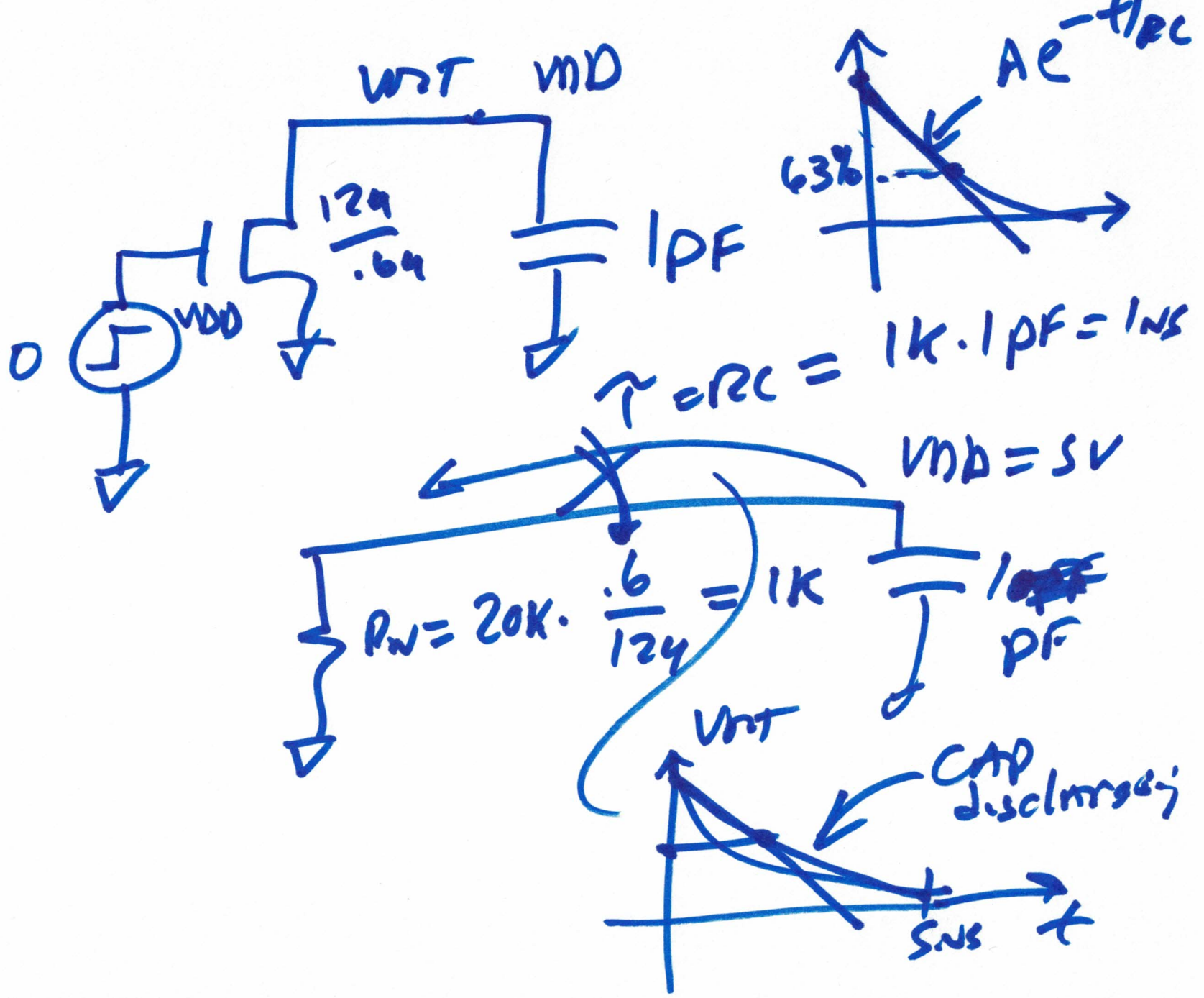
(10)

$$R_N = \frac{5V}{2.5\mu A} = 2.0K$$

$$R_N = R_N' \cdot \frac{4}{w} \uparrow \frac{1}{10}$$

$$R_N' = 20K$$

$$R_{NW} = R_N' \cdot \frac{L}{w}$$



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