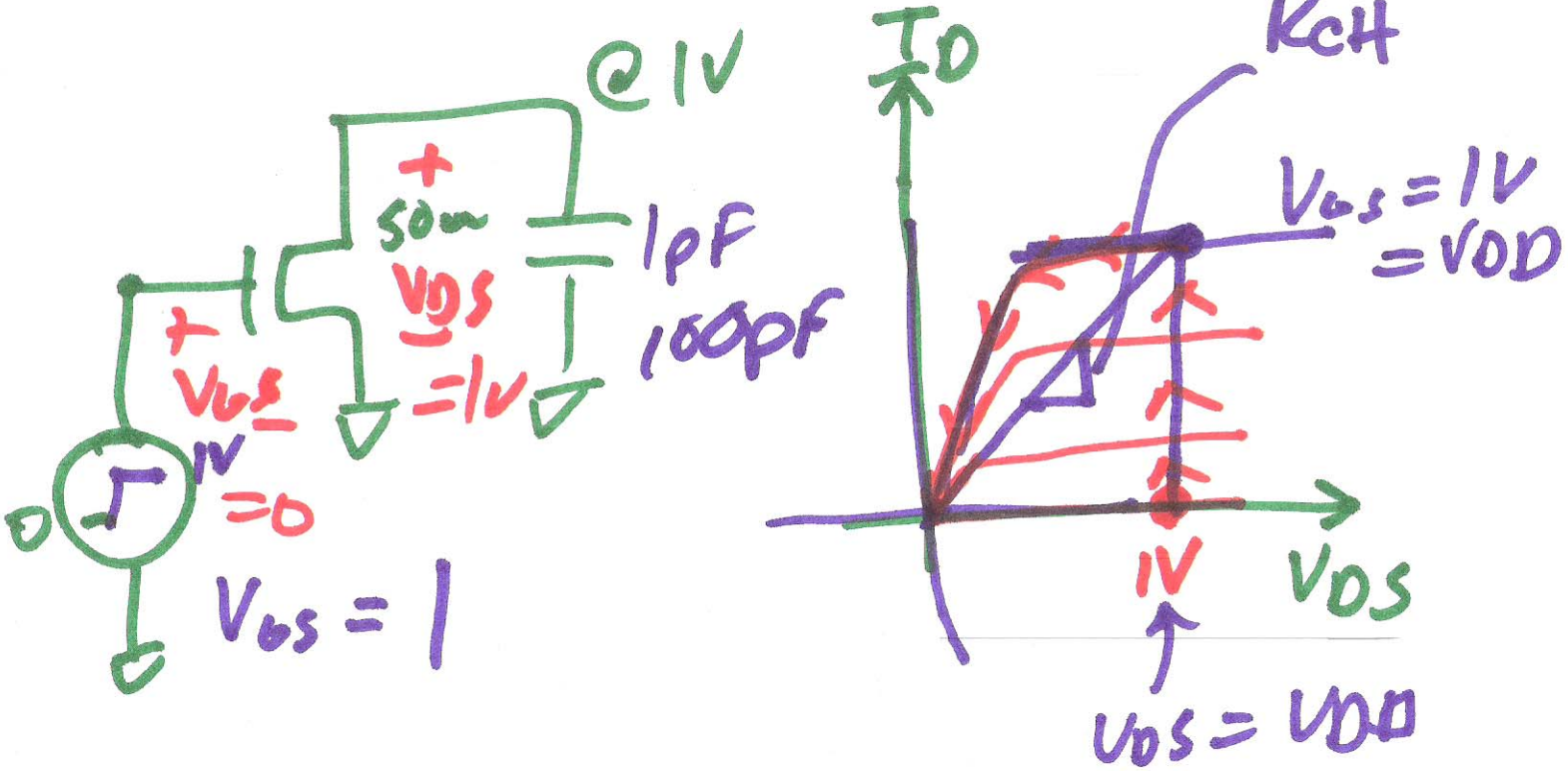
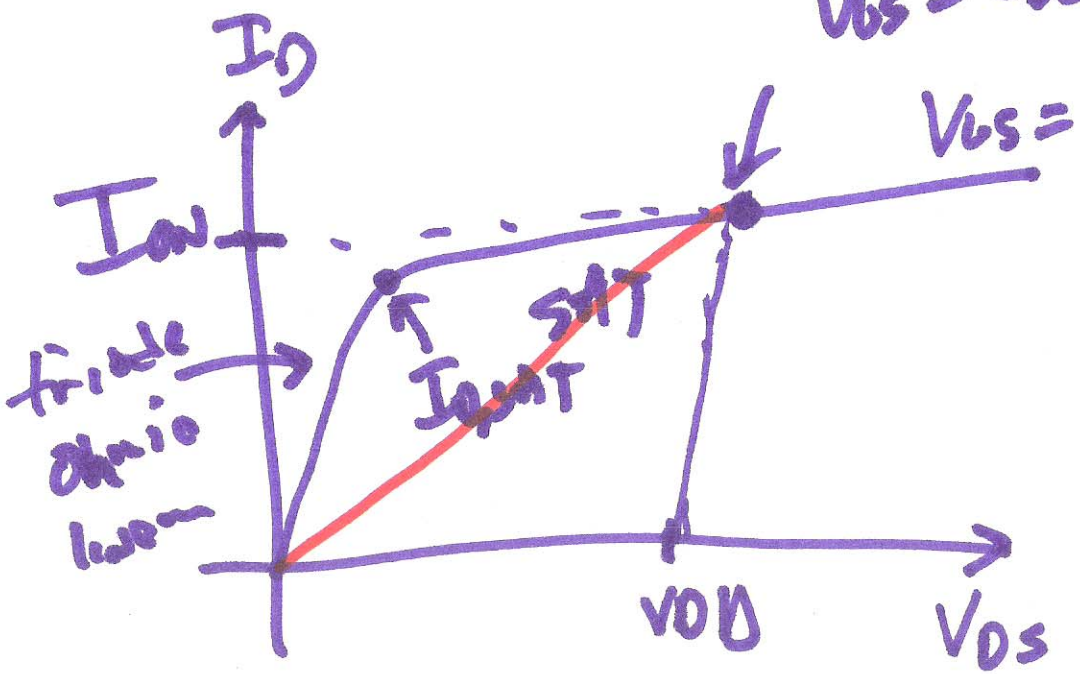
ECE 721

August 24, 2015

Lecture 1



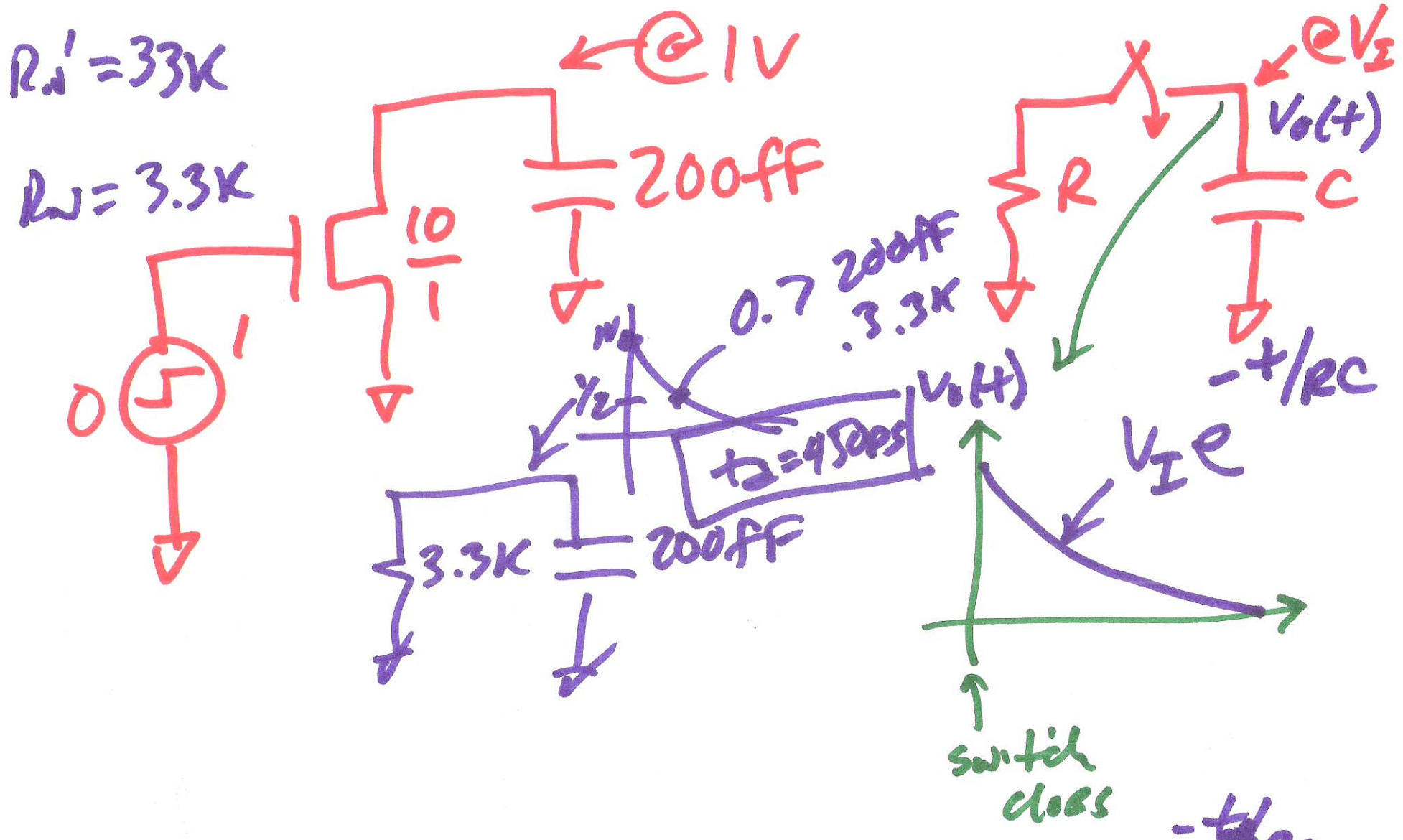


$$\frac{10}{1} = \frac{500\Omega}{50\Omega}$$

$$\frac{V_{DD}}{R_N} = \frac{V_{DD}=1}{300\mu A} = \frac{1}{I_{DS} \cdot \frac{W}{L}}$$

I_{DS}: 30, $\frac{W}{L}$: 10

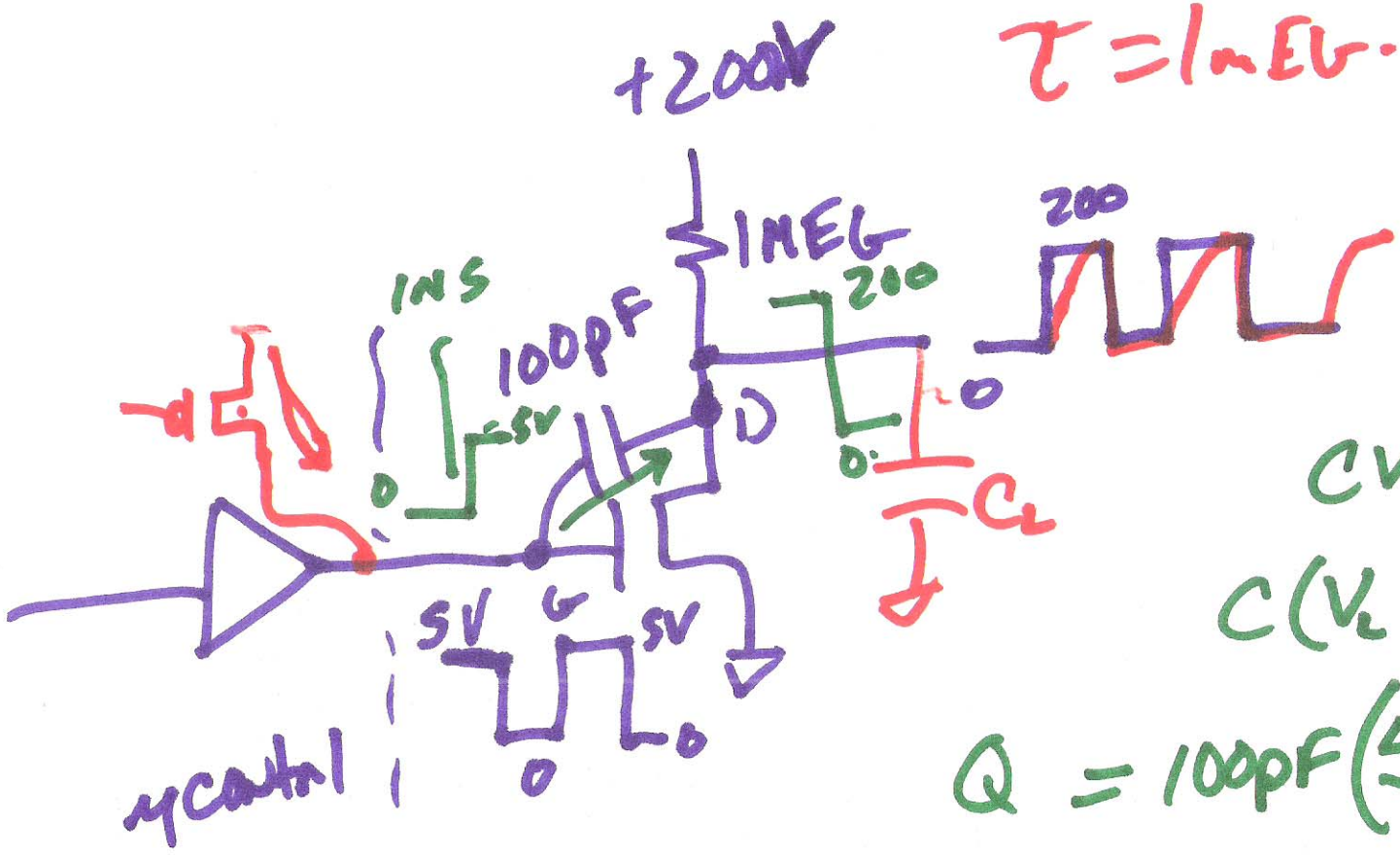
$$R_N = R_N' \cdot \frac{L}{W} \qquad R_N' = \frac{1}{30\mu A} = 33K$$



$$t_{50\%} = -RC \ln 0.5 = +0.69RC$$

$$\frac{V_I}{2} = V_I \cdot e^{-t/RC}$$

$$\boxed{0.7RC}$$



$\tau = 1\text{m}E\text{b} \cdot C_L$

$CV = Q$

$C(V_1 - V_2) = Q$

$Q = 100\text{pF}(5-(-200))$

$1 + |A|$

$I = \frac{20.5\text{NC}}{1\text{NS}}$

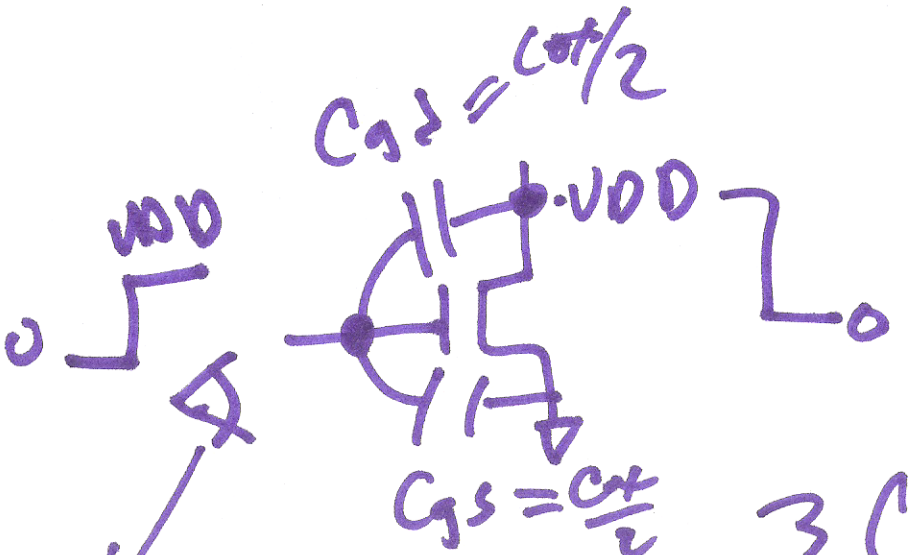
20500 pE

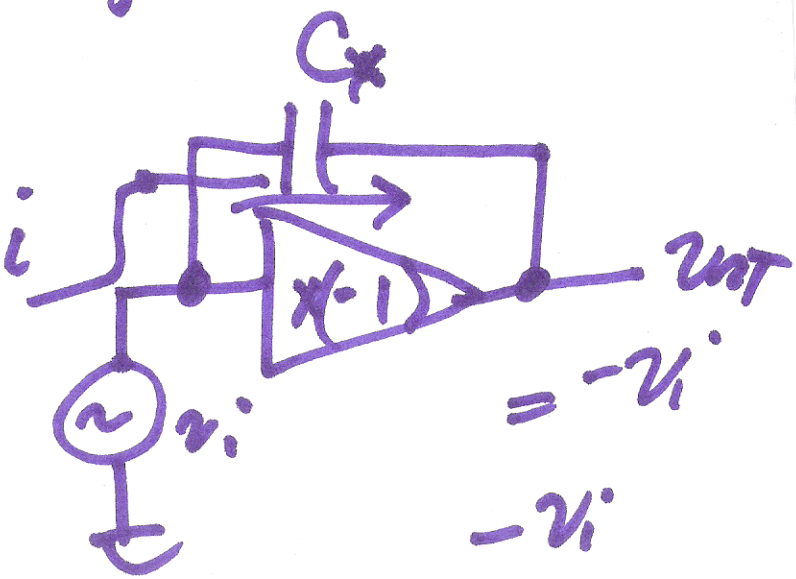
20.5 NE

$I = 20.5\text{A}!$

4)

Assume $C_{gd} \approx C_{gs} \approx C_{ox}/2$

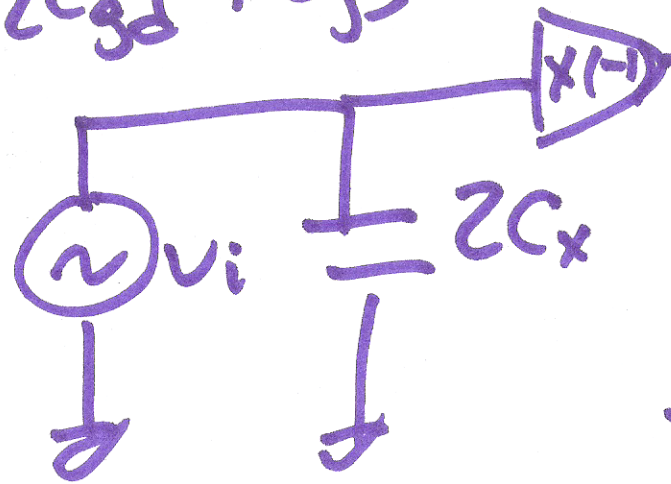




$$C_{in} = 2C_{gd} + C_{gs} = \frac{3}{2} C_{ox}$$

$$= -v_i$$

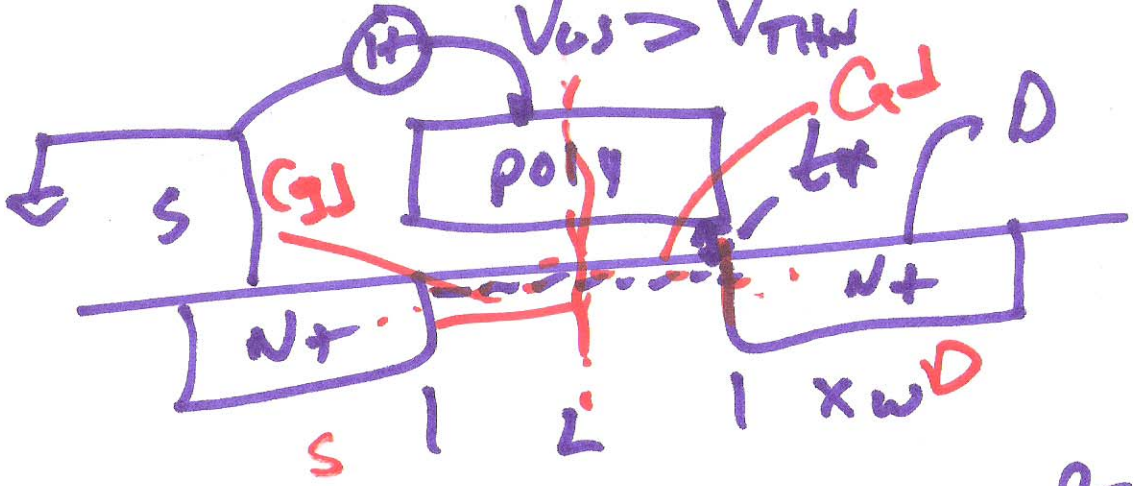
$$-v_i$$

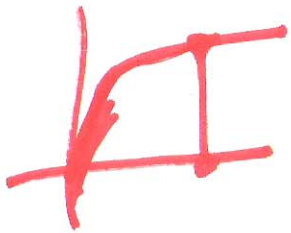


$$i = \frac{v_i - v_{in}}{1/j\omega C_x}$$

$$= \frac{2v_i}{1/j\omega C_x} = \frac{v_i}{1/j\omega 2C_x}$$

5)



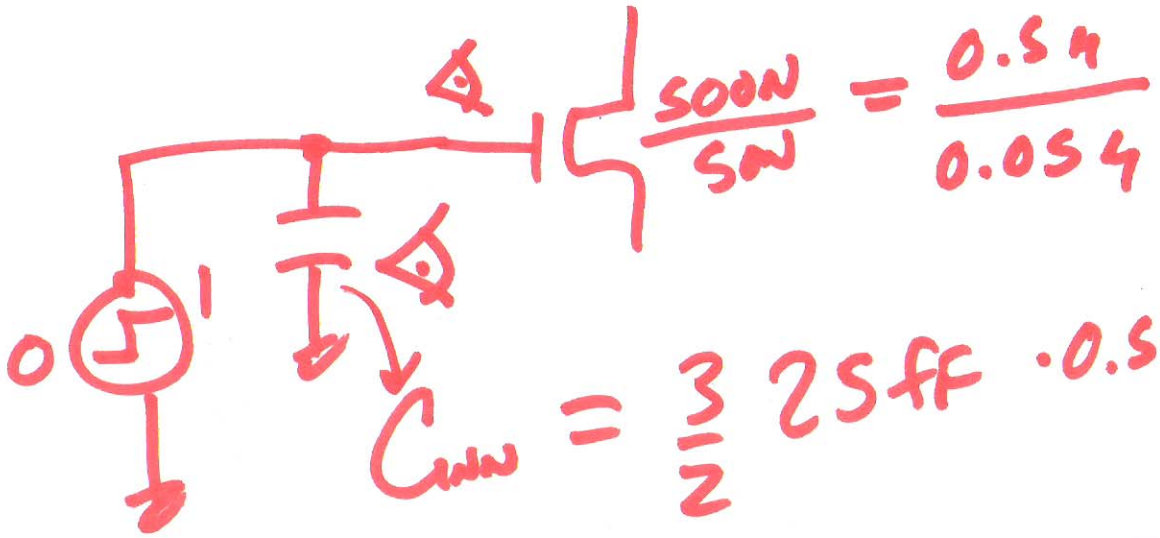


p-sub

$$C_{ox}' = \frac{\epsilon_{ox}}{t_{ox}}$$

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

$C_{ox}' = 25\,fF/\mu m^2$



$C_{INV} = \frac{3}{2} 25fF \cdot 0.5 \cdot 0.05$

$Q = C_{INV} \cdot 1 = 0.9375fF$

$\frac{Q}{T} = I$

$30\mu \cdot 30ps = 900e\text{-}18$

$= .9fC$