

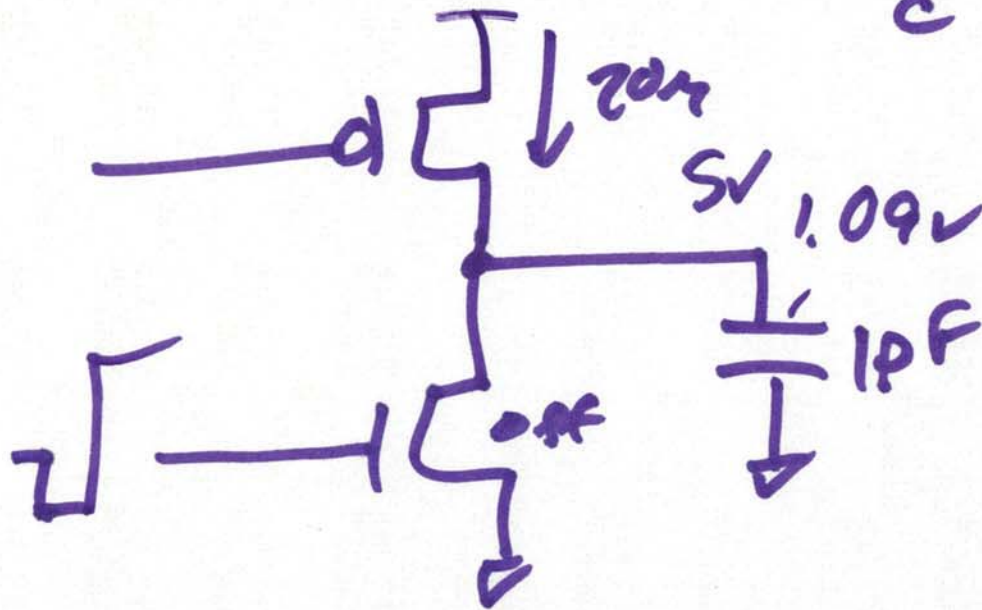
$$5 \text{ M}\Omega = r_{on}$$

$$g_{dsn} = \frac{1}{r_{on}} = \frac{1}{5 \cdot \text{M}\Omega} = 0.2 \times 10^{-6} = 200 \cdot 10^{-9}$$

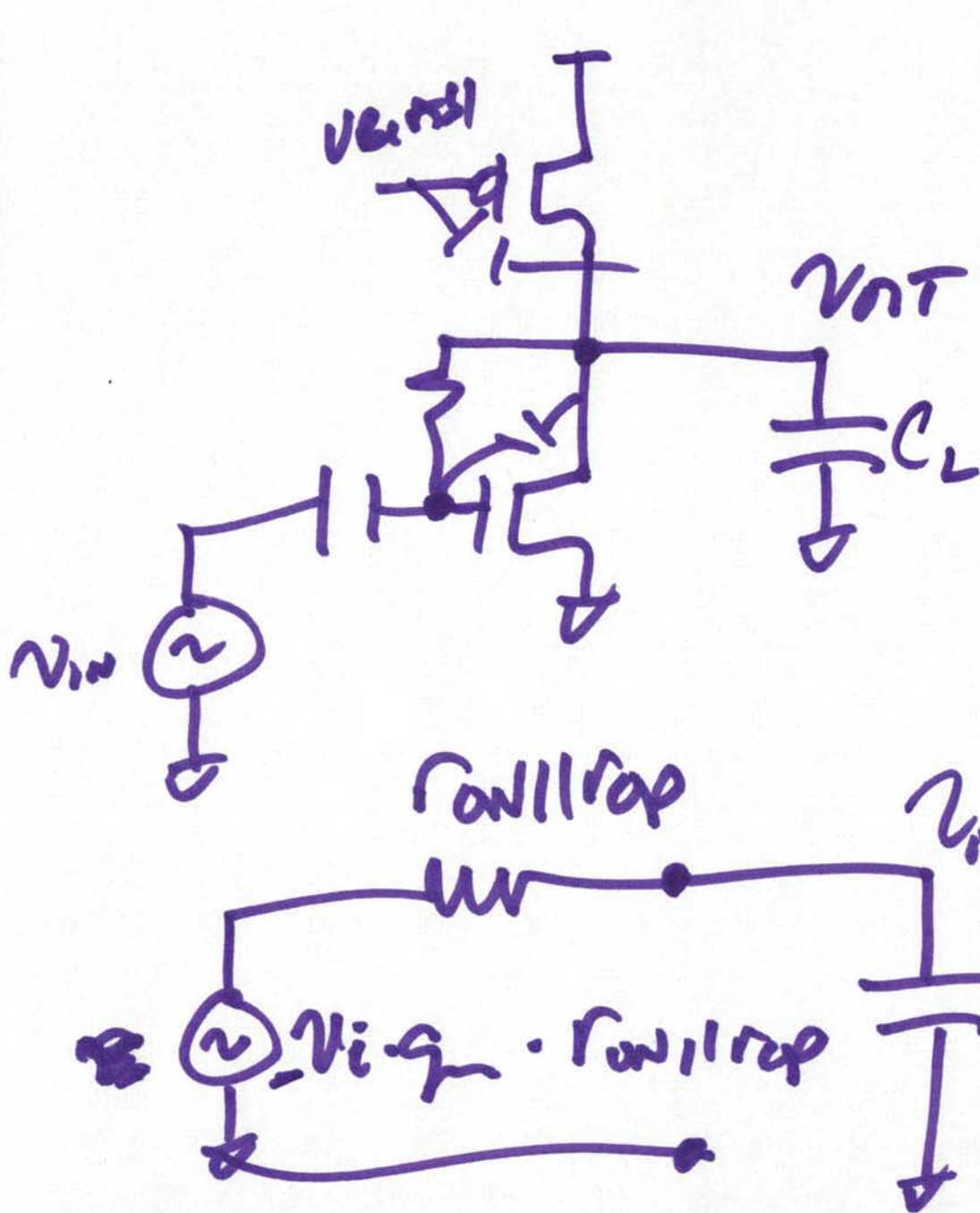
$$g_{dsn} = 0.98 \times 10^{-6} = 980 \times 10^{-9} \approx \frac{1}{1 \text{ M}\Omega}$$

pmos

$$\begin{aligned} \frac{I}{C} &= \frac{dV}{dT} = \frac{20\text{mV}}{1\text{PF}} \\ &= \frac{20\text{V}}{1\text{ns}} \\ &= \frac{20\text{mV}}{1\text{ns}} \end{aligned}$$



2)

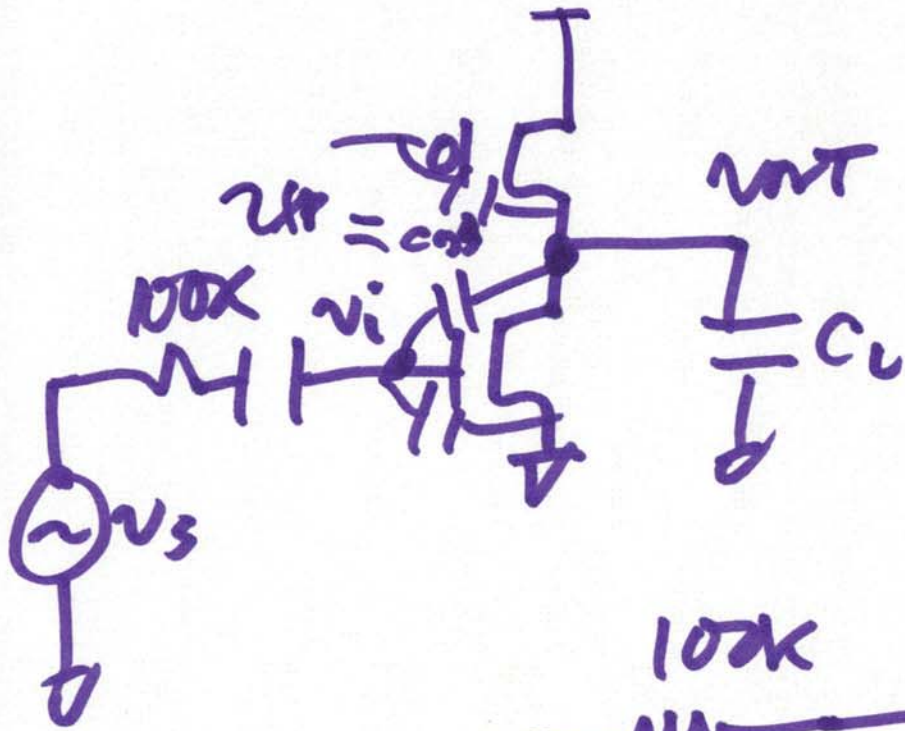


$$f_{3dB} \approx \frac{1}{2\pi r_{o1||r_{o2}} \cdot C_L}$$

$$\frac{1}{2\pi \cdot 2.2M \cdot 1pF} = 72kHz$$

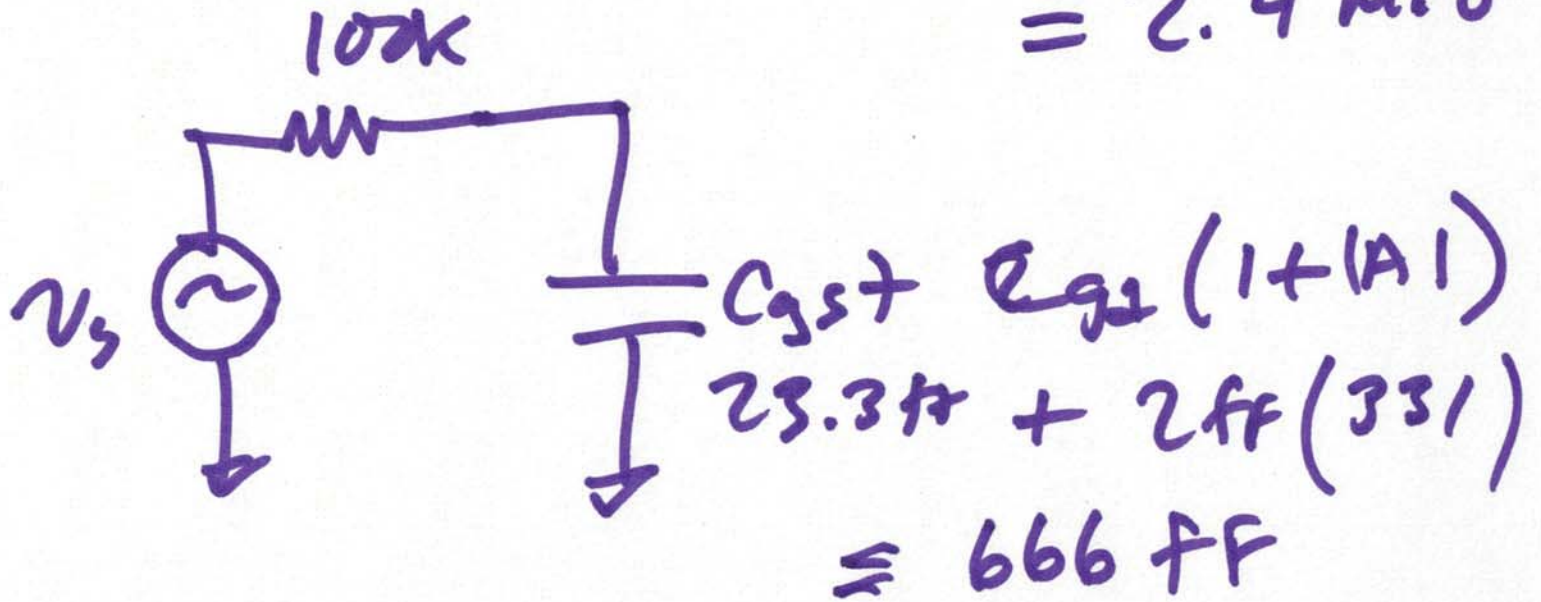
$$= 72kHz \cdot C_{gdw} \cdot \left(1 + \frac{1}{|A|}\right) \approx 1pF$$

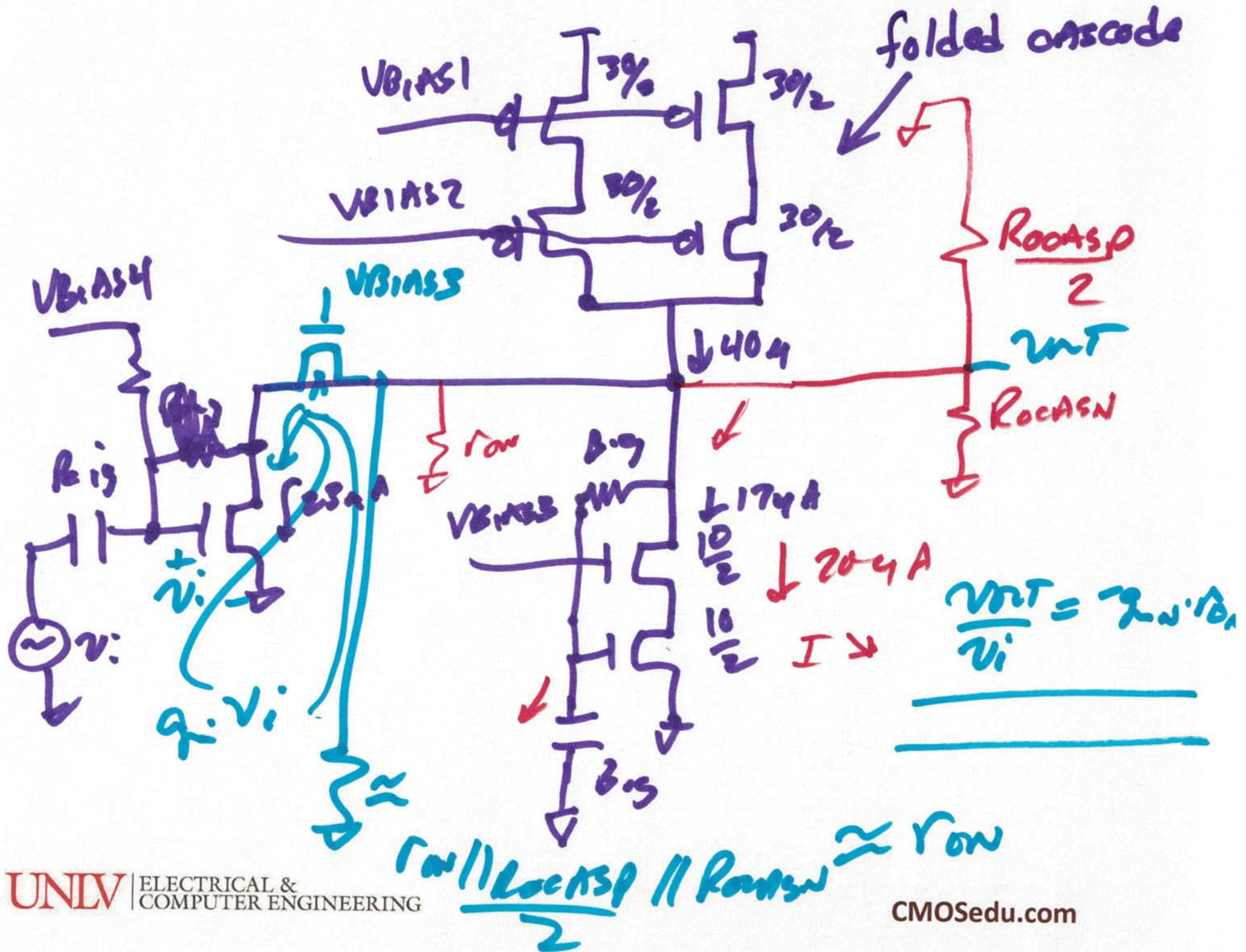
3)



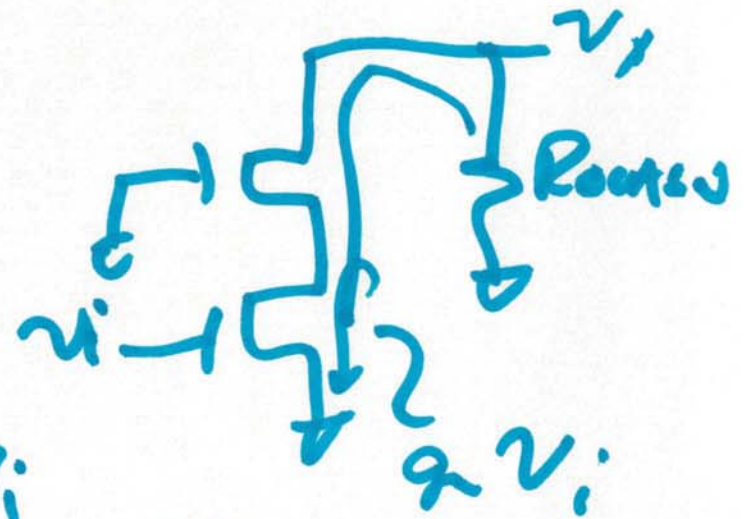
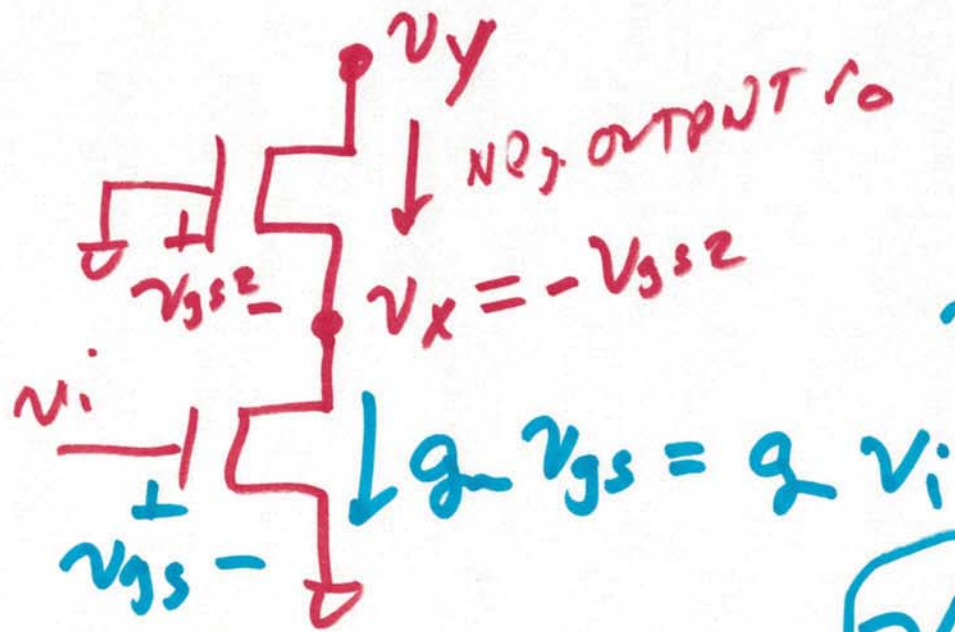
$$f_{3dB} = \frac{1}{2\pi \cdot 100k \cdot 666 \cdot 10^{-15}}$$

$$= 2.4 \text{ MHz}$$





5)

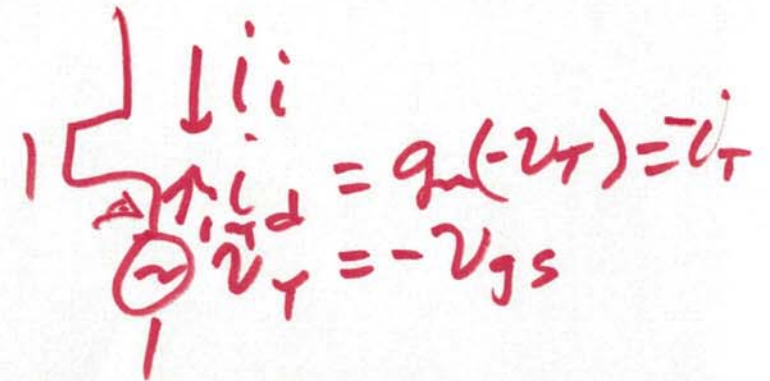


$$v_Y = -g v_i \cdot R_{source}$$

$$-g v_X = +v_{GS2} \cdot g_m = g v_{GS} = g v_i$$

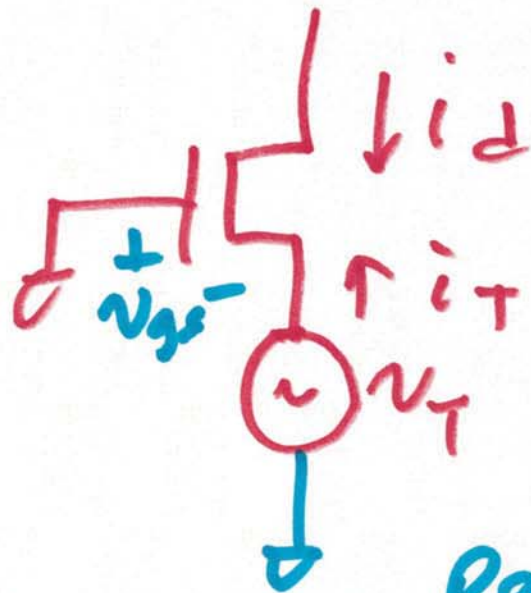
$$v_X = -v_i$$

$$\frac{v_T}{i_T} = \frac{1}{g}$$



4)

Neg. r_{oN}



$$V_T = -V_{gs}$$

$$i_d = g_m V_{gs} = -i_T$$

$$-i_T = g_m \cdot (-V_T)$$

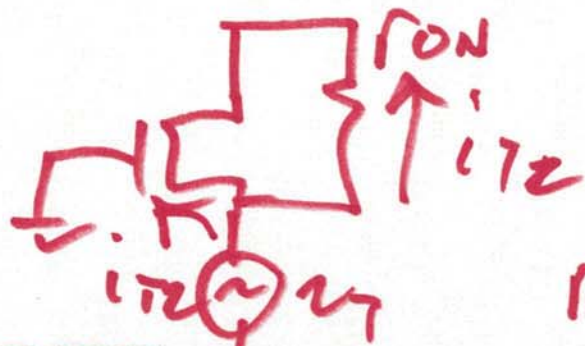
Without neglecting

Resistance

(looking into)

the

$$\text{source} = \frac{V_T}{i_T}$$

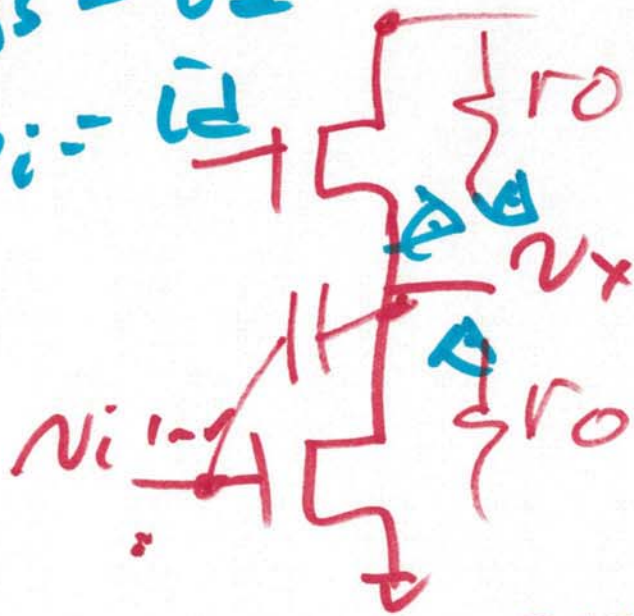


$$r_{oN} \parallel \frac{1}{g_m} \parallel \frac{r_o}{g_m} \approx \frac{1}{g_m}$$

$$= \frac{1}{g_m}$$

$$q_{sys} = i_d$$

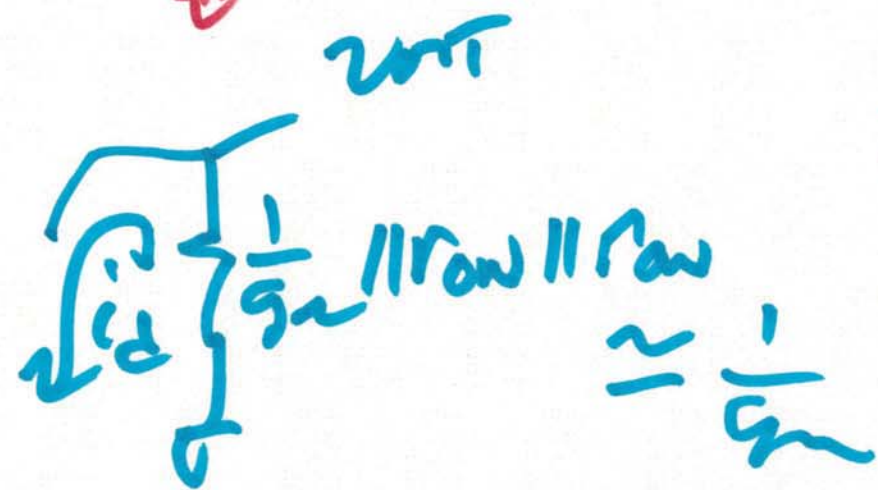
$$q_{v_i} = i_d$$



$$\frac{v_{out}}{v_i} = \frac{-i_d \cdot \frac{1}{g_m} \parallel r_o \parallel r_o}{i_d \cdot \frac{1}{g_m}}$$

$$\frac{v_x}{v_i} = \frac{-\frac{1}{g_m} \parallel r_o \parallel r_o}{\frac{1}{g_m}}$$

$$\approx -1$$



$$= \frac{\text{resistance}}{\frac{1}{g_m}} = -\frac{1}{g_m}$$

8)