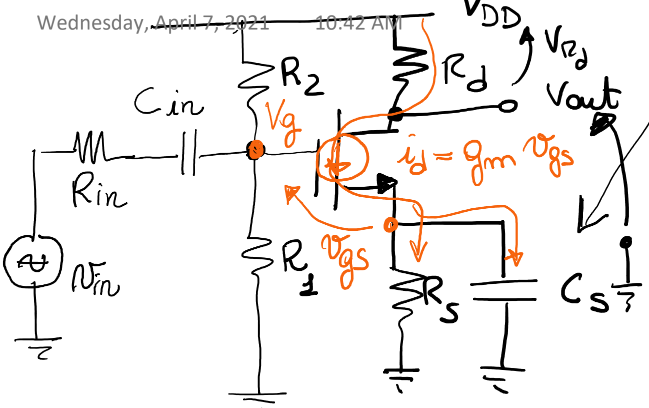
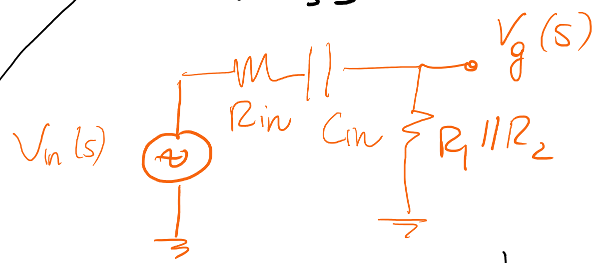
Dimensionamento capacita' di by-pass nello stadio source degenerato

Wednesday, ~~April 7, 2021~~ ~~10:42 AM~~



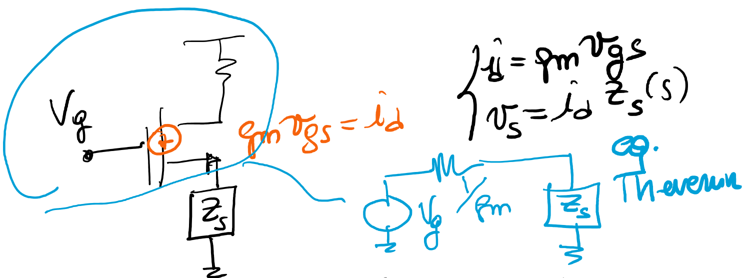
$$Z_S(s) = \frac{R_S}{1+sC_SR_S}$$



zero nell'origine

$$V_g(s) = \frac{R_1//R_2}{R_1//R_2 + R_{in} + 1/sC_{in}} V_{in}(s) = \frac{sC_{in}\, R_1//R_2}{\underbrace{1+sC_{in}(R_1//R_2+R_{in})}_{\text{polo con } \tau_{in} = C_{in}(R_1//R_2+R_{in})}} V_{in}(s)$$

$$i_d(s) = \frac{V_g(s)}{1/g_m + Z_S(s)} = \frac{V_g(s)}{1/g_m + \frac{R_S}{1+sC_SR_S}}$$



$$\begin{cases} i_d = g_m v_{gs} \\ v_S = i_d Z_S(s) \end{cases}$$

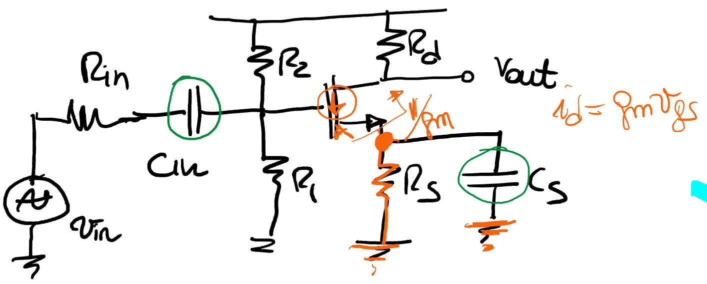
$$V_{out}(s) = -i_d(s) R_d = -\frac{R_d}{\frac{1}{g_m} + \frac{R_S}{1+sC_SR_S}} \cdot \frac{sC_{in}\, R_1//R_2}{1+sC_{in}(R_{in}+R_1//R_2)} V_{in}(s) =$$

$$= -\frac{g_m R_d\,(1+sC_SR_S)}{1+sC_SR_S + g_mR_S} \cdot \frac{sC_{in}\, R_1//R_2}{1+sC_{in}(R_{in}+R_1//R_2)} V_{in}(s)$$

FUNZIONE DI TRASFERIMENTO

$$T(s) \triangleq \frac{V_{out}(s)}{V_{in}(s)} = -\frac{g_m R_d}{(1+g_mR_S)} \cdot \frac{1+sC_SR_S}{1+sC_S\underbrace{\frac{R_S}{1+g_mR_S}}} \cdot \frac{sC_{in}\, R_1//R_2}{1+sC_{in}(R_{in}+R_1//R_2)} =$$

$$\frac{R_S \cdot 1/g_m}{\frac{1}{g_m}+R_S} = R_S // 1/g_m$$



$$= -\frac{g_m R_d}{\ldots} \cdot \frac{1+sC_SR_S}{1+sC_S(R_S // 1/g_m)} \cdot \frac{sC_{in}\, R_1//R_2}{1+sC_{in}(R_{in}+R_1//R_2)}$$

$$= -\frac{g_m R_d}{1+g_m R_S} \cdot \frac{1+sC_sR_s}{1+sC_s\left(R_s \| \frac{1}{g_m}\right)} \cdot \frac{\quad}{1+sC_{in}\left(R_{in}+R_1 \| R_2\right)}$$

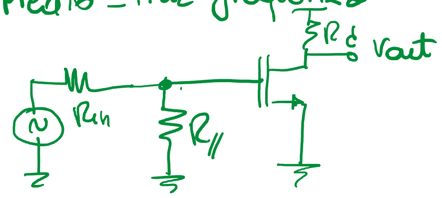
capacità di by pass

- 1 polo con $\tau_p = C_s \left(R_s \| \frac{1}{g_m}\right)$
- 1 zero con $\tau_z = C_s R_s$ $\quad \boxed{\tau_p < \tau_z}$

partizione in ingresso

- zero nell'origine
- polo con τ $\quad \tau_{in} = C_{in}\left(R_{in} + R_1 \| R_2\right)$

Medio_Alta frequenza



$$G_{MF} = \frac{R_{\|}}{R_{in}+R_{\|}} \cdot \left(-g_m R_d\right)$$

$$Z_s(S) = \frac{R_s}{1+sC_sR_s} \rightarrow \infty \quad \text{se} \quad S = -\frac{1}{C_sR_s}$$

Avere uno zero nella FdT significa che $\exists\, \bar{s}$ t.c. $\forall\, V_{in}(\bar{s}) \neq 0$

$V_{out}(\bar{s}) = 0$