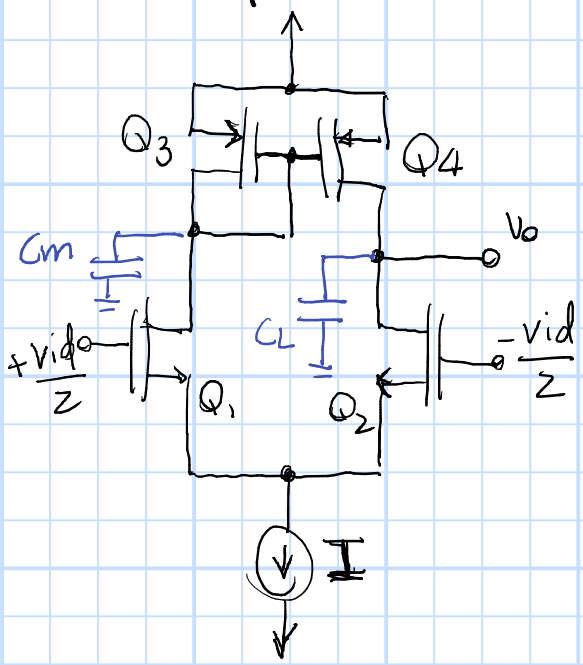
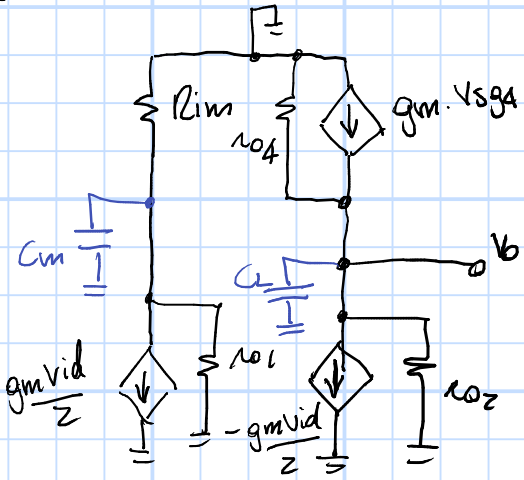
• Análise Par diferencial com carga ativa

- Resposta em alta frequência



pequenos sinais. ⇒



• Análise dos pólos - Método das constantes de tempo

1- Vid → 0

2 → olhar Cm

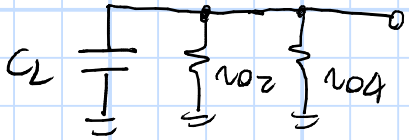
→ $R_{im} = \frac{1}{g_{m3}} // r_{o3}$

→ $R_{eq} = r_{o1} // r_{o3} // \frac{1}{g_{m3}}$

→ Assumindo $\frac{1}{g_{m3}} << r_o$ → $R_{eq} \cong \frac{1}{g_{m3}}$

$\tau_1 = C_m \cdot \frac{1}{g_{m3}} = \frac{C_m}{g_{m3}}$

3→ Olhar C_L

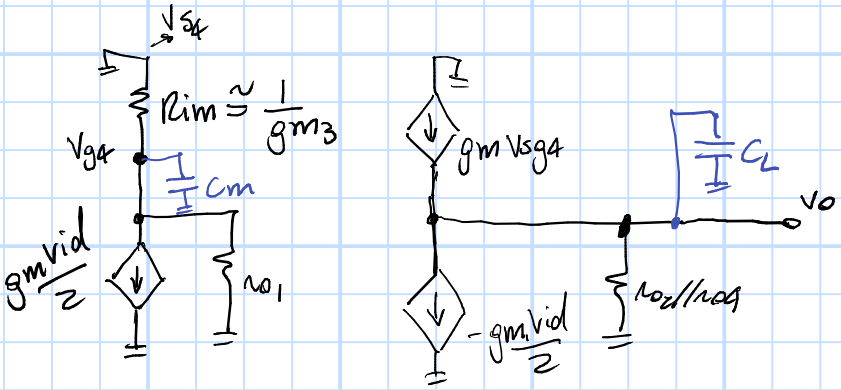


$R_{eq} = r_{o2} // r_{o4}$

$\tau_2 = C_L (r_{o2} // r_{o4})$

$$\omega_H \cong \frac{1}{C_m/g_{m3} + C_L (r_{o2} // r_{o4})}$$

• Análise completa da F.T.



$$V_{g4} = -\frac{g_{m_1} v_{id}}{2} \cdot \left(\underbrace{R_{im} // r_{o_1}}_{\sim 1/g_{m_3}} // \frac{1}{sC_m} \right)$$

$$V_{g4} \cong -\frac{g_{m_1} \cdot v_{id}}{2} \cdot \frac{\frac{1}{g_{m_3}} \cdot \frac{1}{sC_m}}{\frac{1}{g_{m_3}} + \frac{1}{sC_m}} = \frac{-g_{m_1}/g_{m_3}}{s\frac{2C_m}{g_{m_3}} + 2} \cdot v_{id} \Rightarrow \text{Se } g_{m_1} = g_{m_3} = g_m$$

$$V_{g4} = \frac{-1 \cdot v_{id}}{s\frac{2C_m}{g_m} + 2}$$

$$V_o = \left(g_m V_{sg4} + g_m \frac{v_{id}}{2} \right) \cdot \left(r_{o_2} // r_{o_4} // \frac{1}{sC_L} \right) \rightarrow \text{Assumindo } r_{o_2} = r_{o_4} = r_o$$

$$V_o = \left[-g_m V_{g4} + \frac{g_m}{2} v_{id} \right] \left[\frac{r_o}{2} // \frac{1}{sC_L} \right]$$

$$\frac{V_o}{v_{id}} = \left[\frac{g_m/2}{s\frac{C_m}{g_m} + 1} + \frac{g_m}{2} \right] \left[\frac{r_o/2 \cdot 1/sC_L}{r_o/2 + 1/sC_L} \right]$$

$$A_v = \frac{g_m}{2} \left(\frac{s\frac{C_m}{g_m} + 2}{1 + sC_m/g_m} \right) \left(\frac{r_o/2}{sC_L \frac{r_o}{2} + 1} \right)$$

$$\boxed{A_v = \left(g_m \frac{r_o}{2} \right) \left[\frac{\left(s\frac{C_m}{2g_m} + 1 \right)}{\left(1 + s\frac{C_m}{g_m} \right) \left(1 + s\frac{C_L r_o}{2} \right)} \right]}$$

A_m $\quad \omega_{p_1}$ $\quad \omega_{p_2}$ $\quad \omega_z$