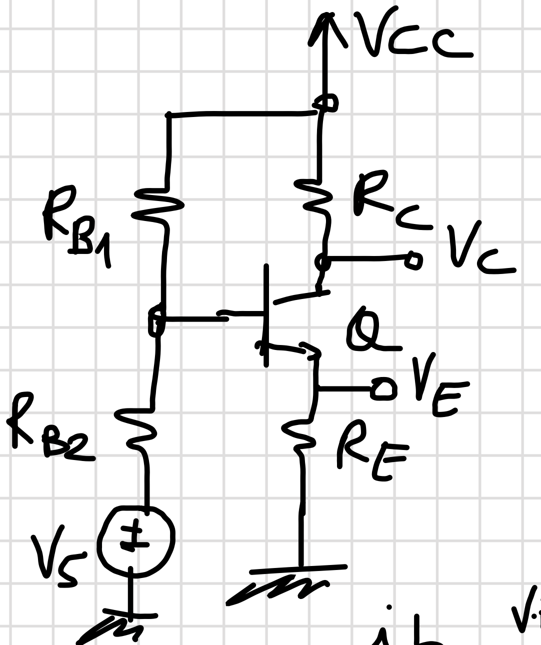
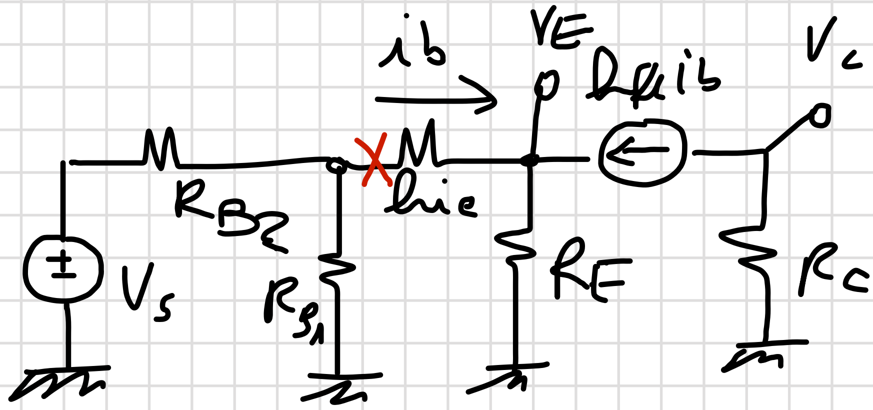
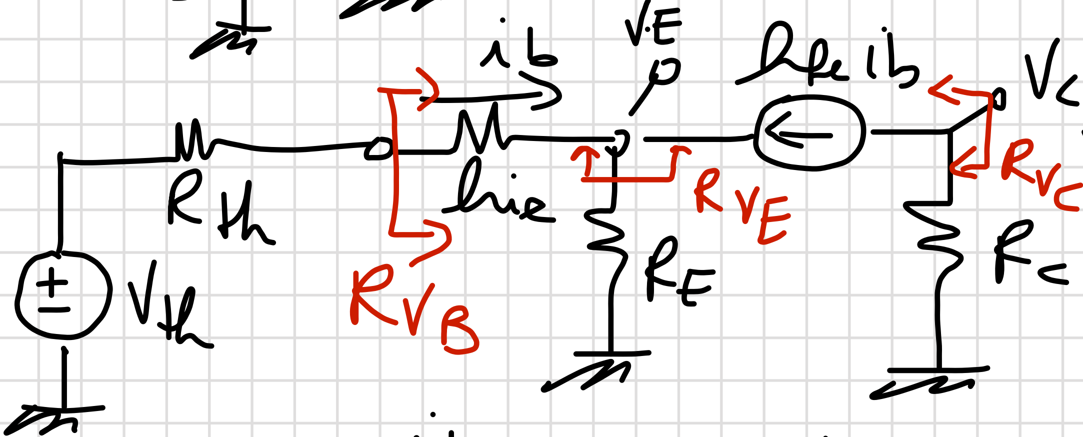
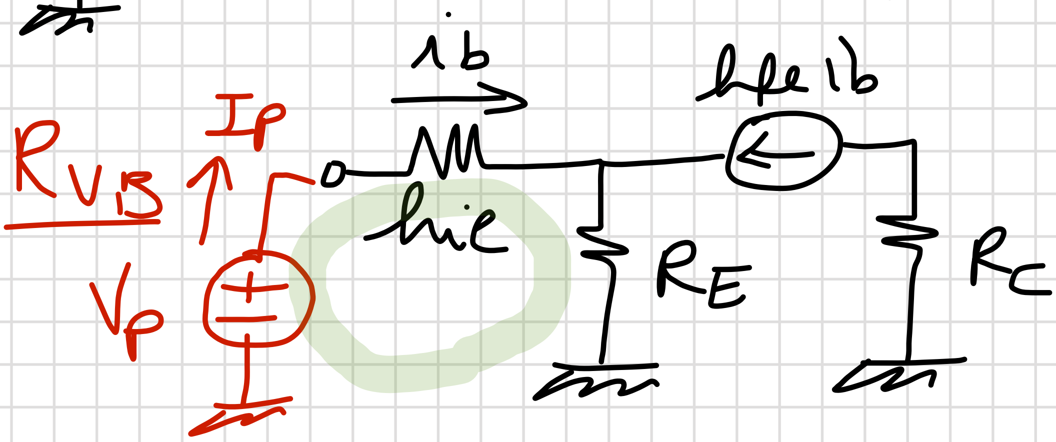






$$V_{th} = \frac{R_{B1} V_S}{R_{B1} + R_{B2}}$$

$$R_{th} = R_{B1} // R_{B2}$$



$$R_{VB} = \frac{V_p}{I_p}$$

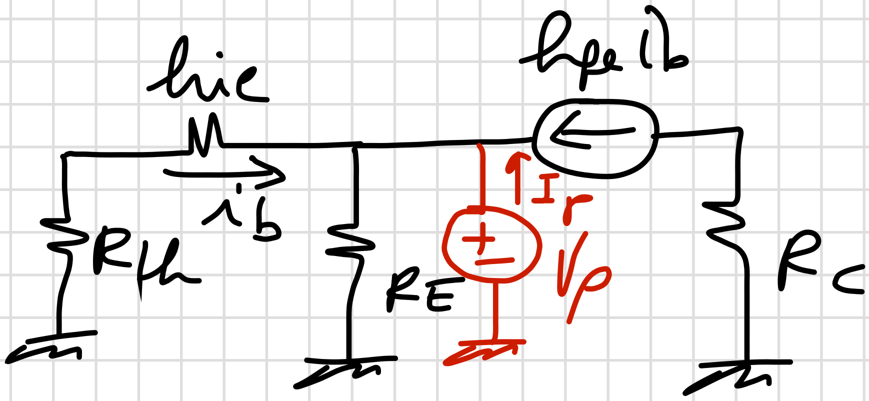
$$V_p = h_{ie}\, i_b + R_E (h_{fe}+1)\, i_b$$

$$i_b = I_p$$

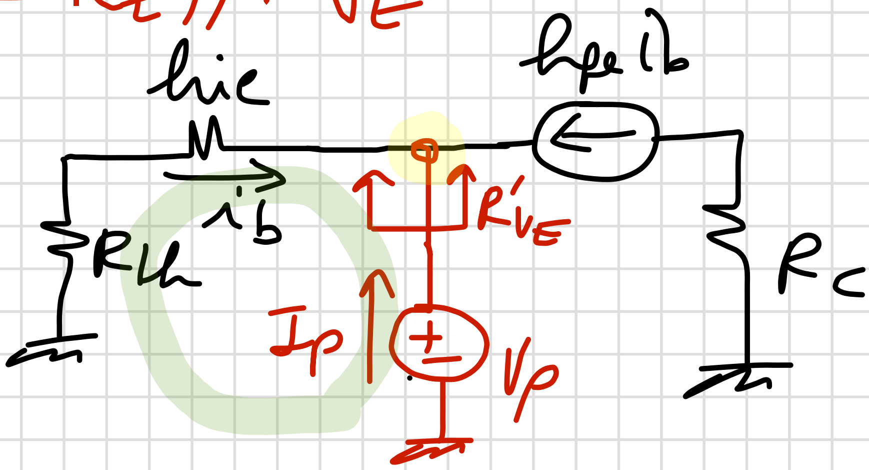
$$V_p = h_{ie}\, I_p + R_E (h_{fe}+1)\, I_p$$

$$\frac{V_p}{I_p} = h_{ie} + R_E (h_{fe}+1) = R_{VB} \quad 10 \div 100\,k\Omega$$

R_{VE}



$$R_{VE} = R_E // R'_{VE}$$

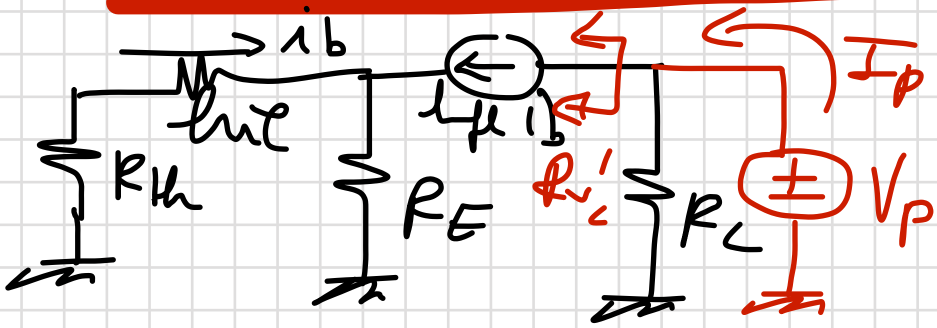


$$\begin{cases} (h_{fe}+1)\, i_b = -I_p \\ (R_{th}+h_{ie})\, i_b = -V_p \end{cases} \Rightarrow i_b = -\frac{I_p}{h_{fe}+1}$$

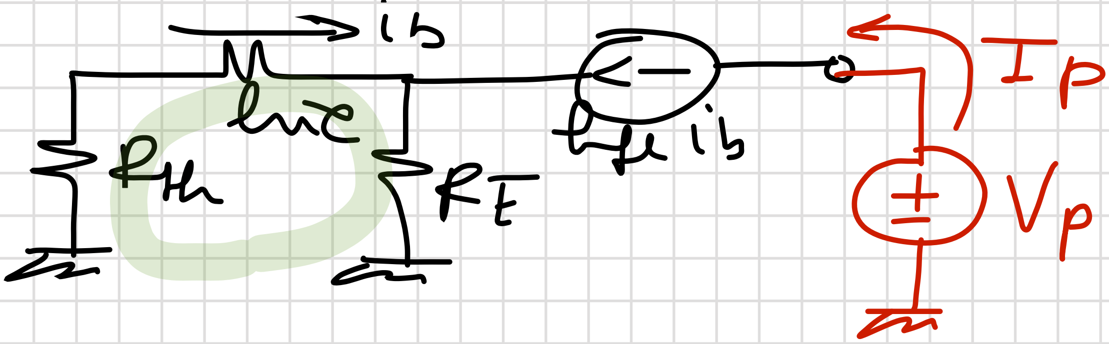
$$V_p = \frac{R_{th}+h_{ie}}{h_{fe}+1} I_p \Rightarrow R_{VE}' = \frac{R_{th}+h_{ie}}{h_{fe}+1}$$

$$R_{VE} = R_E // \left[\frac{R_{th}+h_{ie}}{h_{fe}+1}\right] \simeq 10 \div 100\,\Omega$$

R_{VC}



$$R_{VC} = R_C // R_{VC}'$$

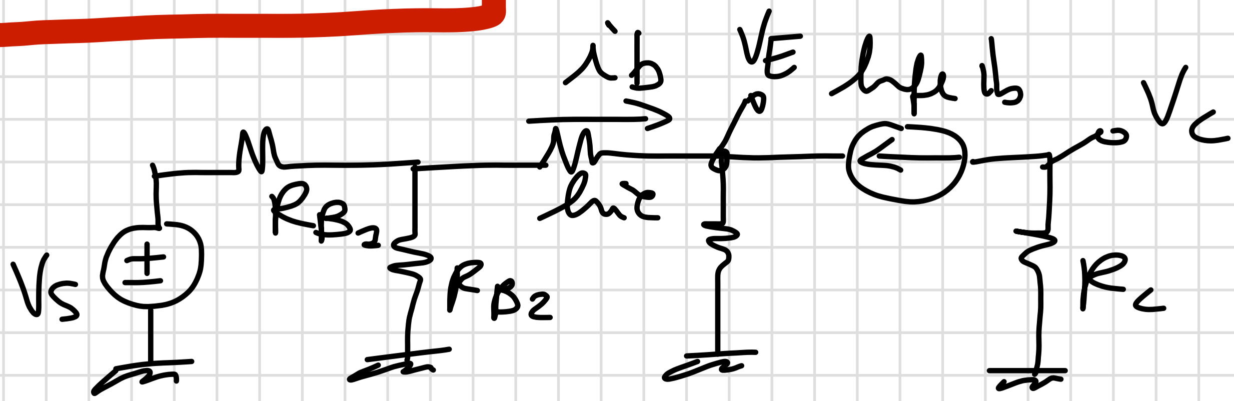


$$+(R_{th}+h_{ie})\, i_b + R_E(h_{fe}+1)\, i_b = 0$$

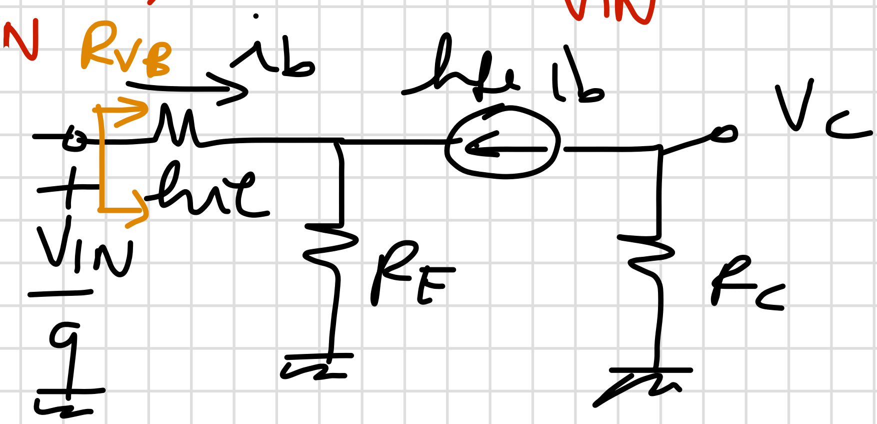
$$i_b = 0 \Rightarrow h_{fe} i_b = 0 = I_p$$

$$R_{V_C}' \longrightarrow +\infty$$

$$\boxed{R_{V_C} = R_C}$$



$$A_{V_C} = \frac{V_C}{V_{IN}} \quad ; \quad A_{V_E} = \frac{V_E}{V_{IN}}$$



$$V_C = -R_C h_{fe} i_b$$

$$i_b = \frac{V_{IN}}{R_{VB}} = \frac{V_{IN}}{h_{ie} + R_E(h_{fe}+1)}$$

$$V_C = -\frac{h_{fe} R_C V_{IN}}{h_{ie} + R_E(h_{fe}+1)}$$

$$\boxed{A_{VC} = \frac{V_C}{V_{IN}} = -\frac{h_{fe} R_C}{h_{ie} + R_E(h_{fe}+1)}}$$

$$R_E(h_{fe}+1) \gg h_{ie} \Rightarrow$$

$$\boxed{A_{VC} \simeq -\frac{h_{fe} R_C}{R_E(h_{fe}+1)} \simeq -\frac{R_C}{R_E}}$$

$\underline{A_{VE}}$

$$V_E = R_E(h_{fe}+1) i_b$$

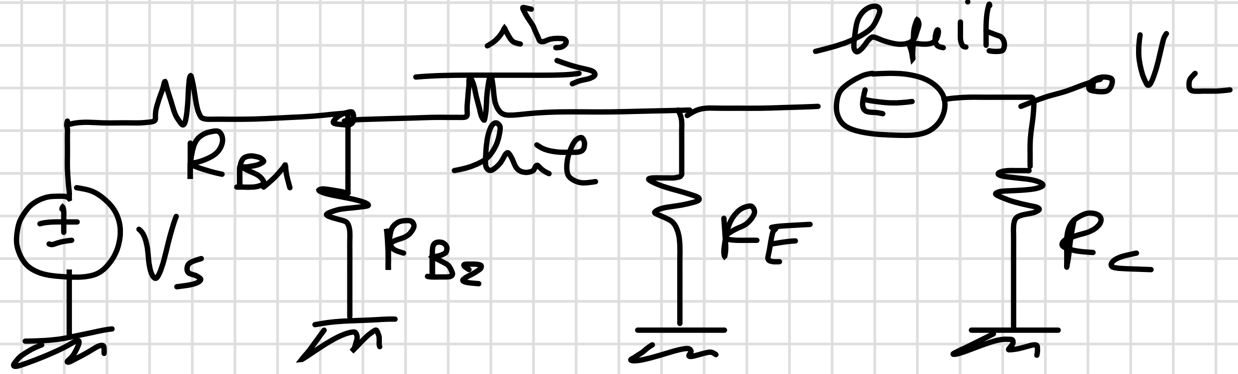
$$i_b = \frac{V_{IN}}{h_{ie} + R_E(h_{fe}+1)}$$

$$V_E = \frac{R_E(h_{fe}+1) V_{IN}}{h_{ie} + R_E(h_{fe}+1)} \Rightarrow \boxed{A_{VE} = \frac{R_E(h_{fe}+1)}{R_E(h_{fe}+1) + h_{ie}}}$$

$$h_{ie} \ll R_E(h_{fe}+1)$$

$$\Downarrow$$

$$\boxed{A_{VE} \simeq 1}$$

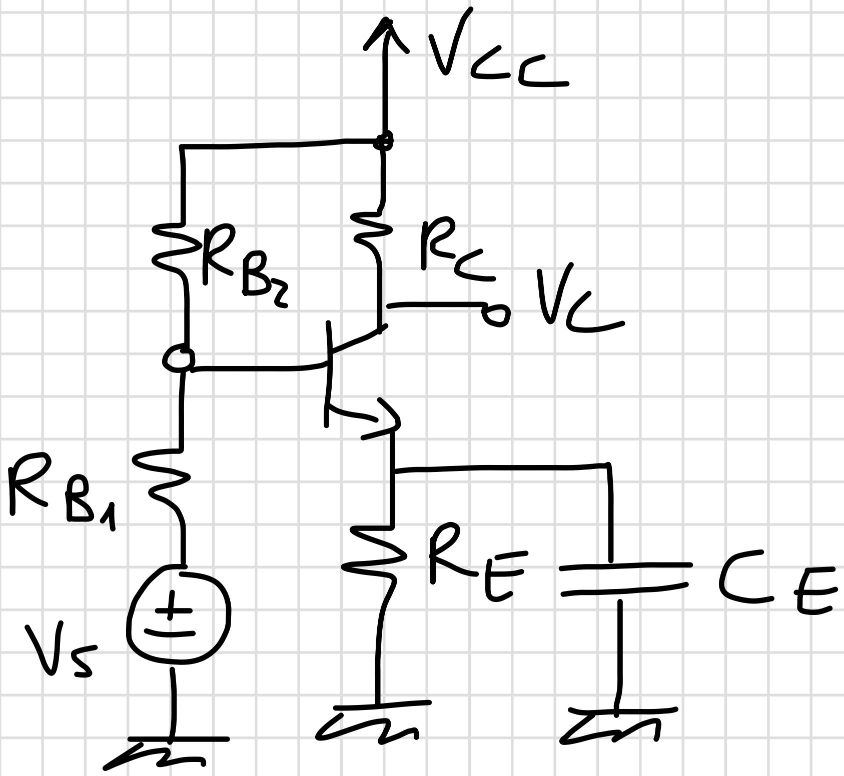


$$V_C = -R_C h_{fe} i_b$$

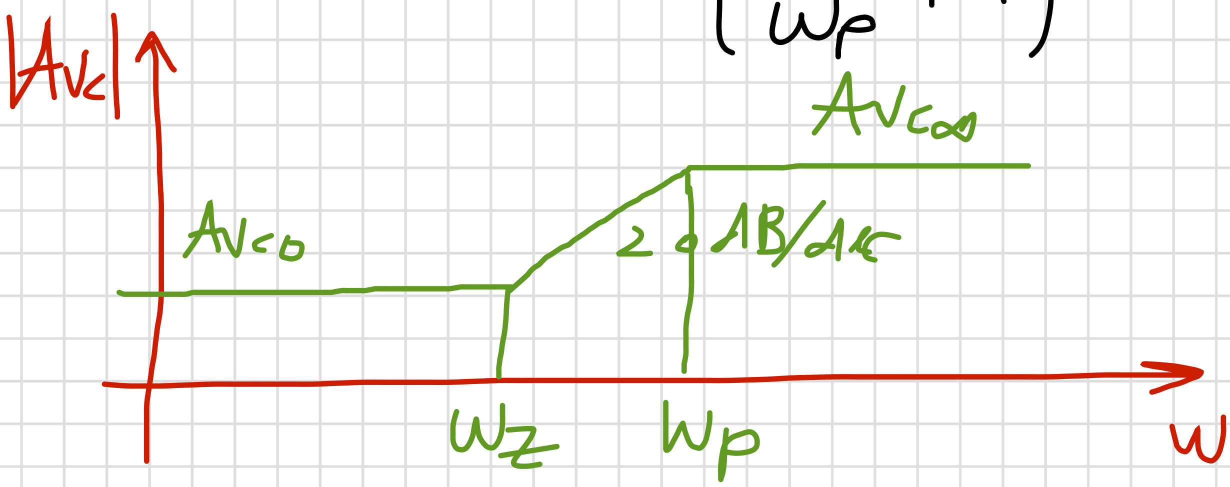
$$i_b = \frac{V_{th}}{R_{th} + h_{ie} + R_E(h_{fe}+1)}$$

$$A_{V_C} = \frac{V_C}{V_S} = \frac{R_C h_{fe}}{R_{th} + h_{ie} + R_E(h_{fe}+1)} \frac{R_{B2}}{R_{B1}+R_{B2}}$$

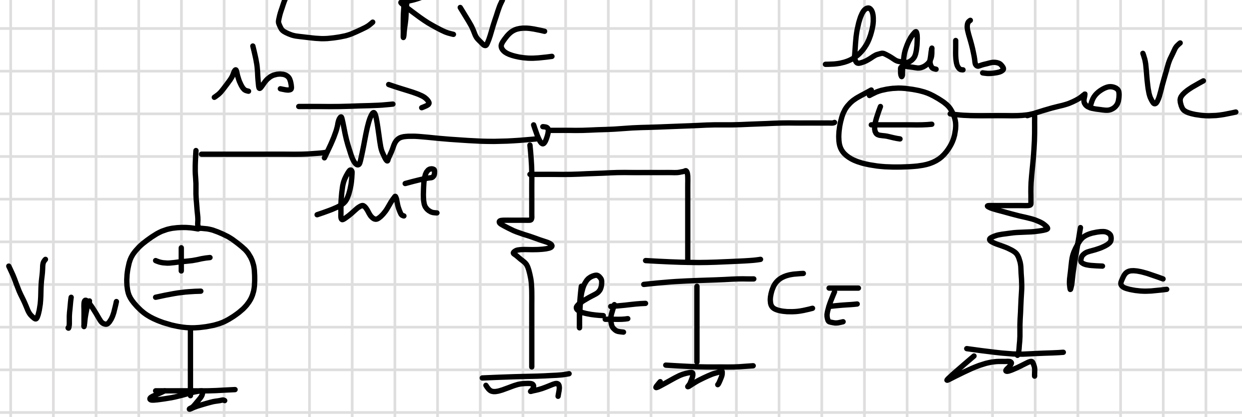
$$A_{V_E} = \frac{V_E}{V_S} = \frac{R_E(h_{fe}+1)}{R_{th} + h_{ie} + R_E(h_{fe}+1)} \frac{R_{B2}}{R_{B1}+R_{B2}}$$



$$A_{vc}(s) = A_{vc0}\,\frac{\left(\frac{s}{\omega_z}+1\right)}{\left(\frac{s}{\omega_p}+1\right)}$$



$$\omega_p = \frac{1}{C R_{VC}}$$



$$A_{vc}(s) = \frac{A_{vc0}\left(\frac{s}{\omega_0}+1\right)}{\left(\frac{s}{\omega_p}+1\right)}$$

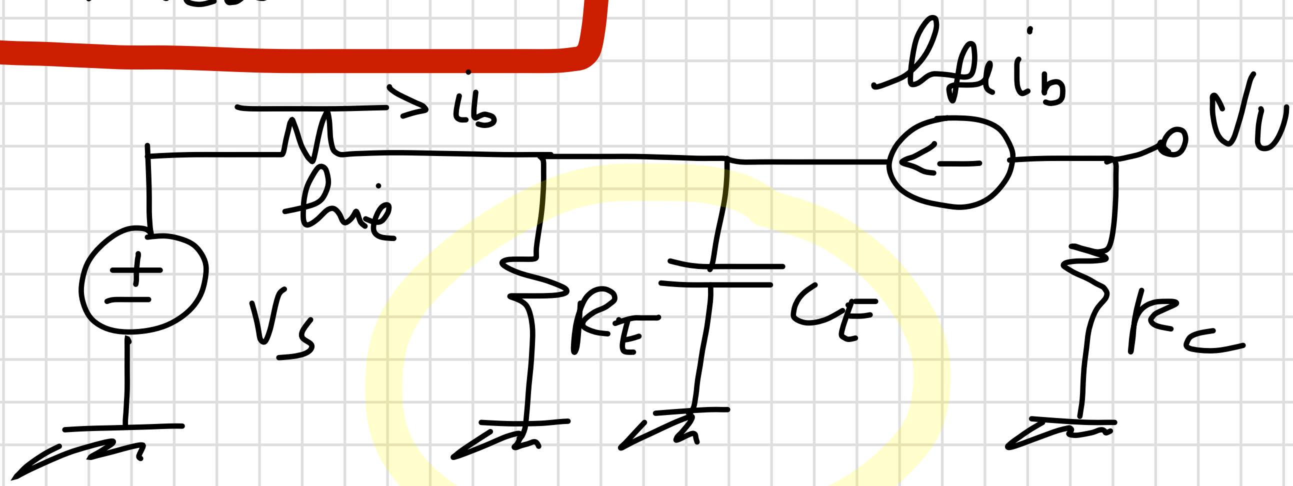
$$A_{vc0} = -\frac{R_c h_{fe}}{h_{ie}+R_E(h_{fe}+1)}$$

$$A_{vc\infty} = -\frac{R_c h_{fe}}{h_{ie}} = -g_m R_c \qquad g_m = \frac{h_{fe}}{h_{ie}}$$

$$\omega_p = \frac{1}{C_E R_{VCE}} \qquad R_{VCE} = R_E /\!/ \left(\frac{h_{ie}}{h_{fe}+1}\right)$$

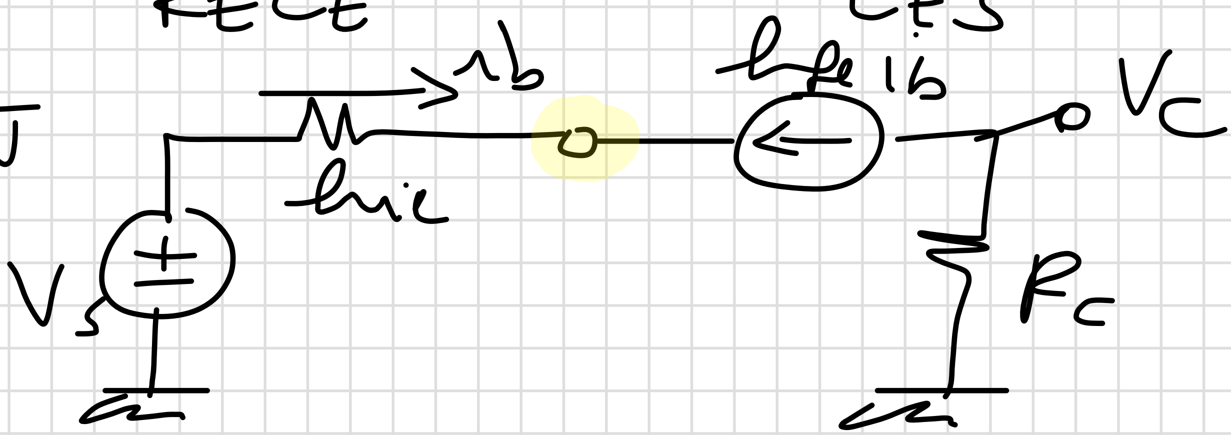
$$\lim_{s \to +\infty} A_V(s) = A_{VC\infty} = A_{VC0} \frac{\omega_p}{\omega_0}$$

$$\boxed{\omega_0 = \frac{A_{VC0}}{A_{VC\infty}} \omega_p}$$



$$\bar{\omega} = \frac{1}{R_E C_E} \Rightarrow R_E // \frac{1}{C_E s} \to +\infty$$

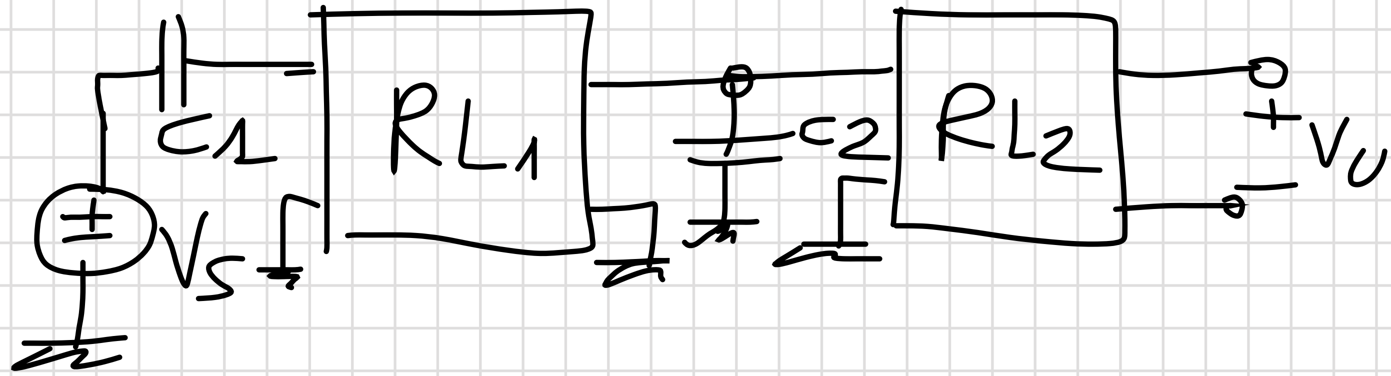
Per $\bar{\omega}$



$$i_b = -h_{fe} i_b \Rightarrow i_b = 0$$

$$\Rightarrow V_c = 0 \Rightarrow \boxed{\bar{\omega} = \omega_0}$$

$$A_{VCE} = \frac{A_{VE}}{\left(1 + \frac{s}{\omega_p}\right)}$$



C1
RL1
C2
RL2
Vs
Vu