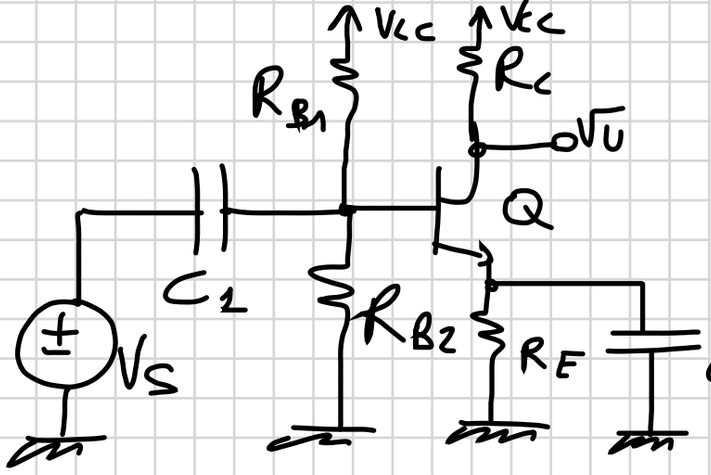


$h_{FE} = 100$

$r_{b'b} = 100\,\Omega$

$R_C = 2\,k\Omega$

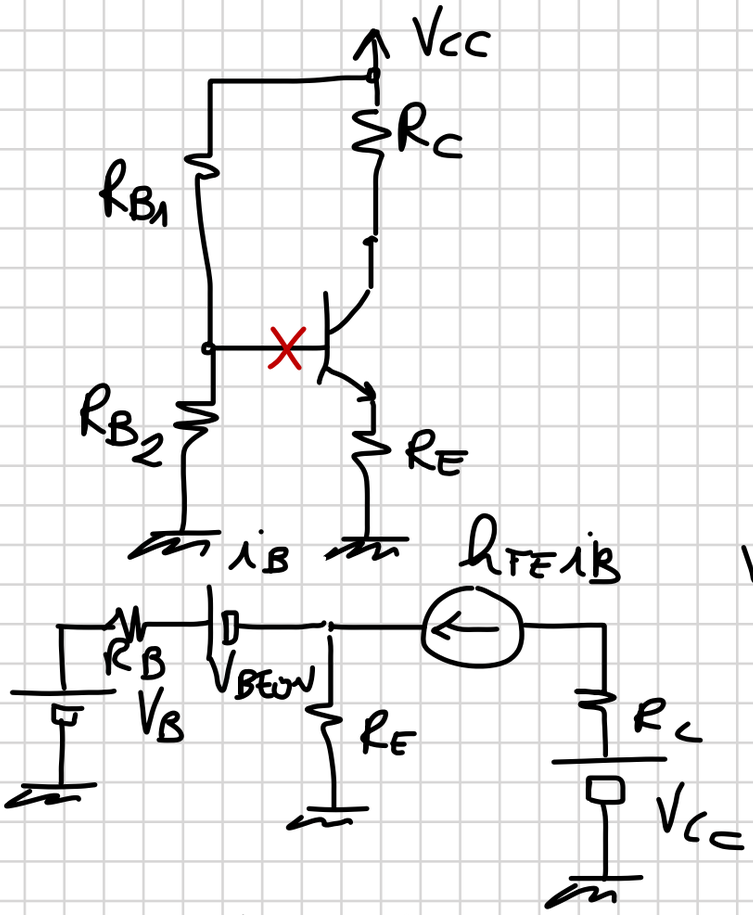
$R_E = 0{,}5\,k\Omega$

$C_E \; R_{B1} = 10\,k\Omega$

$R_{B2} = 2\,k\Omega$

$C_E = 10\,\mu F$

$C_1 \to +\infty$



$$V_B = \frac{R_{B2}\, V_{cc}}{R_{B1}+R_{B2}}$$

$$R_B = R_{B1} \,//\, R_{B2}$$

$$I_B = \frac{V_B - V_{BEon}}{R_B + (h_{FE}+1)R_E} = 24{,}92\,\mu A$$

$$I_C = h_{FE} I_B = 2{,}492\,mA$$

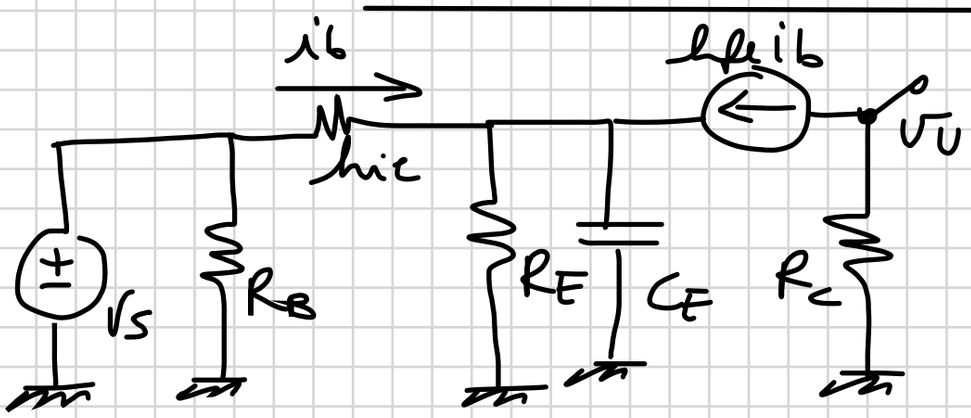
$$I_E = I_C + I_B = (h_{FE}+1) I_B = 2{,}517\,mA$$

$$V_{CE} = V_C - V_E = \underbrace{V_{cc} - R_c I_C}_{V_C} - \underbrace{R_E I_E}_{V_E} =$$

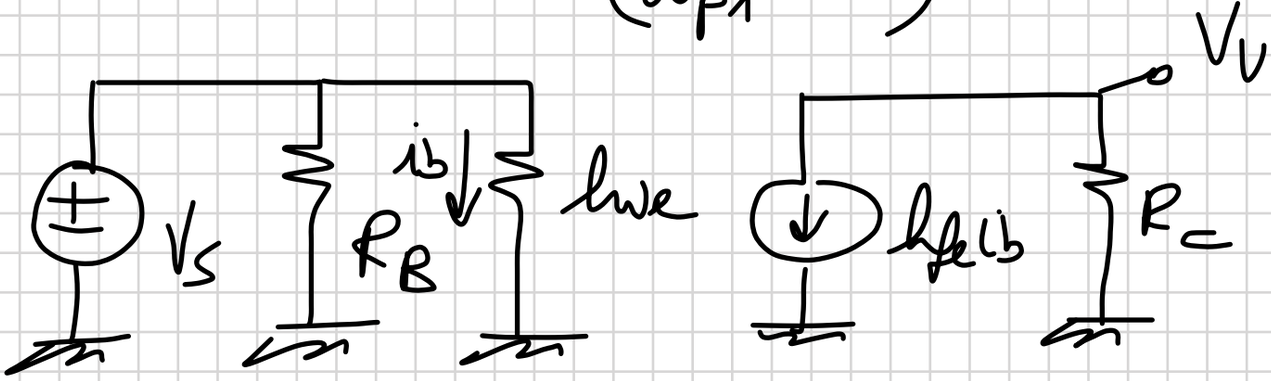
$$= 5{,}758\,V$$

$$h_{fe} = h_{FE}$$

$$h_{ie} = r_{bb'} + \frac{V_T}{I_C} h_{fe} = 1143\ \Omega$$



$$A_f(s) = \frac{V_U}{V_S} = \frac{}{\left(\frac{s}{\omega_{p1}} + 1\right)}$$



$$V_U = -h_{fe} R_C i_b \qquad i_b = \frac{V_S}{h_{ie}}$$

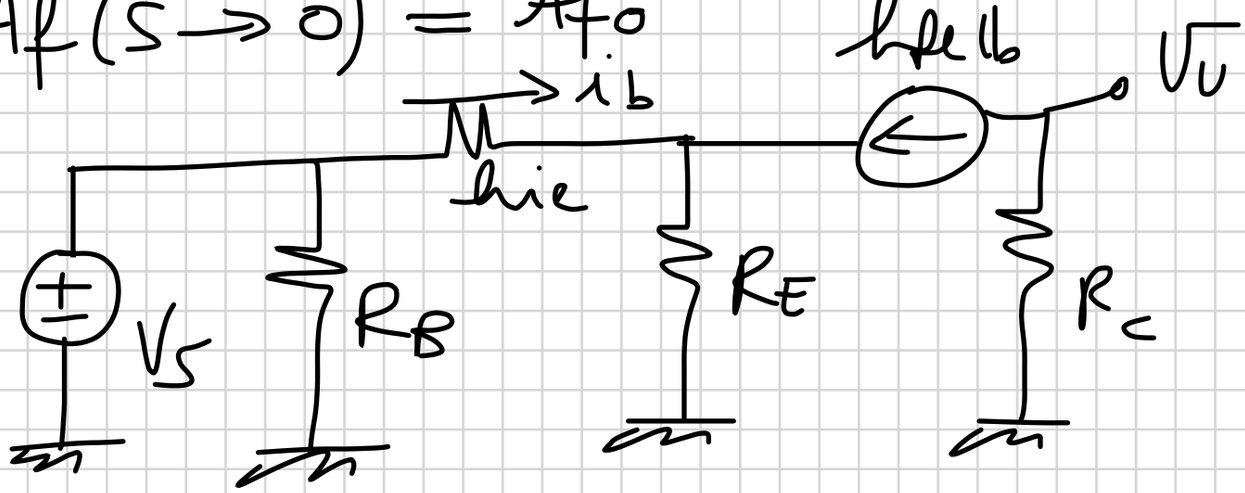
$$\frac{V_U}{V_S} = A_{f\infty} = -\frac{h_{fe} R_C}{h_{ie}} = -g_m R_C$$

$$g_m = \frac{h_{fe}}{h_{ie}}$$

$$A_f = \frac{A_{f0}\left(\frac{s}{\omega_0} + 1\right)}{\left(\frac{s}{\omega_{p1}} + 1\right)}$$

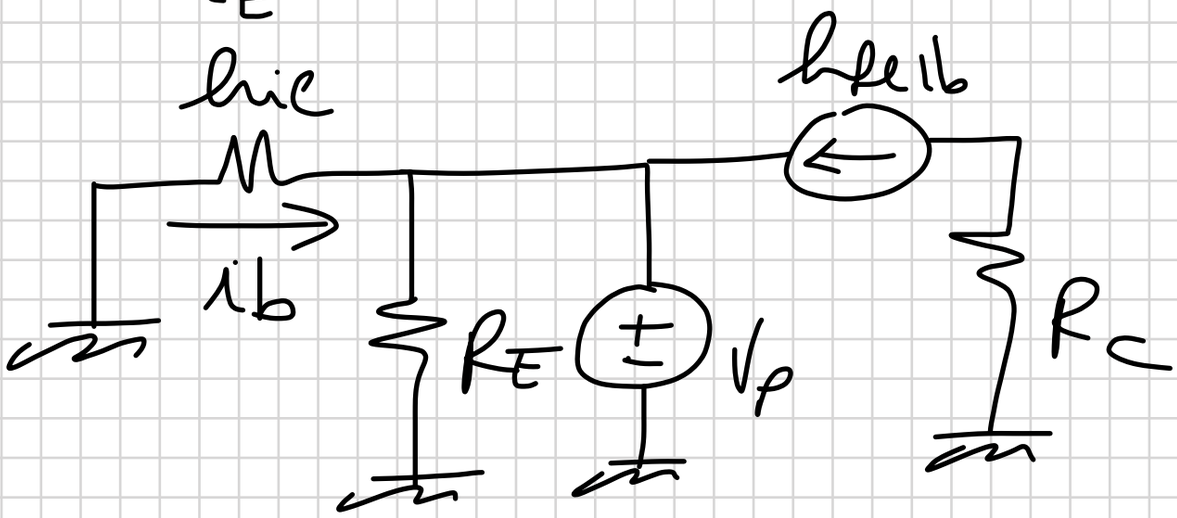
$$A_f = \frac{A_{f0}\left(\frac{s}{\omega_0}+1\right)}{\left(\frac{s}{\omega_{p1}}+1\right)}$$

$A_f(s \to 0) = A_{f0}$



$$A_{f0} = \frac{V_U}{V_S} = \frac{-R_C h_{fe}}{R_E(h_{fe}+1)+h_{ie}} = -3884$$

$$\omega_{p1} = \frac{1}{R_{VCE} C_E} \; ; \; R_{VCE} =$$



$$R_{VCE} = R_E // \frac{h_{ie}}{h_{fe}+1}$$

$$A_{f\infty} = \frac{A_{f0}\, \omega_{p1}}{\omega_0}$$

$$A_{f\infty} = -\frac{h_{fe} R_C}{h_{ie}} = -200$$

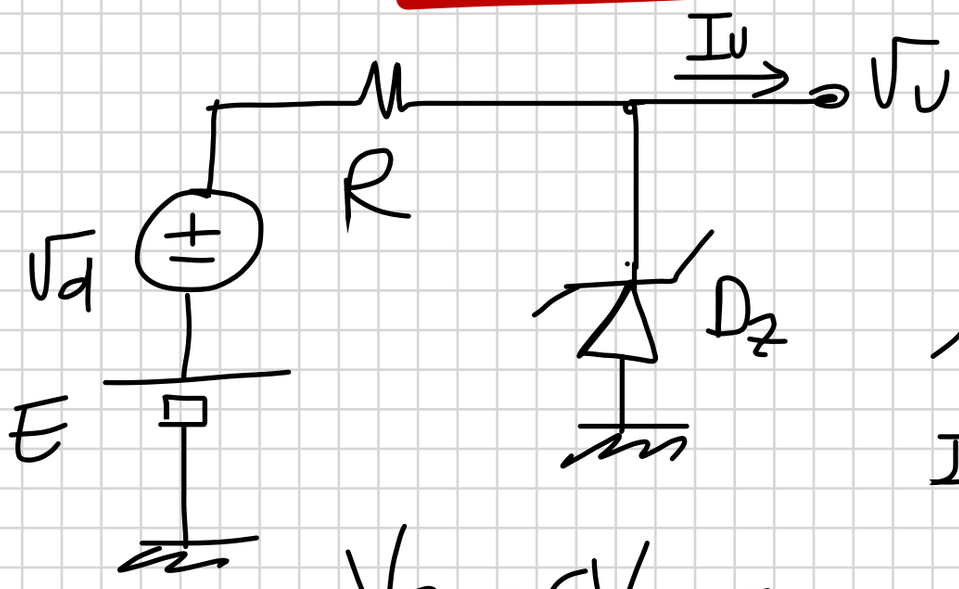
$$A_{f0} = -3{,}884$$

$$\omega_0 = \frac{A_{f0}}{A_{f\infty}}\, \omega_{p1} \Rightarrow f_0 = \frac{\omega_0}{2\pi} = 15\,\text{MHz}$$

$$f_{p1} = \frac{\omega_{p1}}{2\pi} = 8{,}19\,\text{kHz}$$

$$R_E // \frac{1}{C_E S} \longrightarrow +\infty$$

$$\omega_0 = \frac{1}{R_E C_E}$$

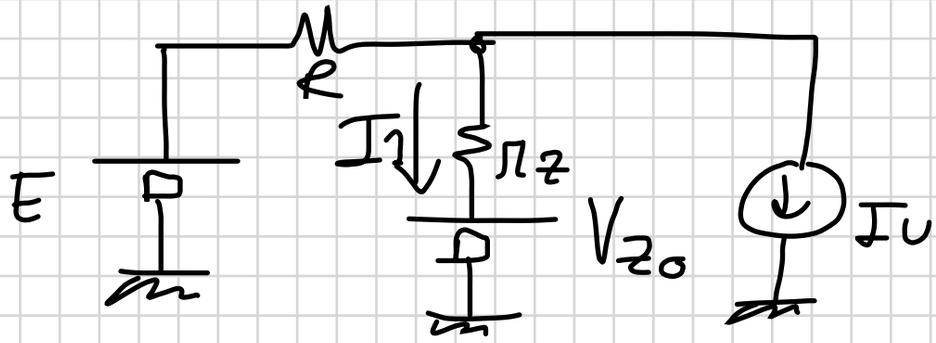


$10\,V < E < 12\,V$

$I_u < 100\,mA$

$V_Z = 6V$, $r_Z = 4\Omega$ @ $I_Z = 50mA$

$r_{ZK} = 100\Omega$ @ $I_{ZK} = 1\,mA$



$r_z = 4\Omega$ $\quad V_{z0} = V_z - r_z I_z = 5{,}8V$

$I_1 > 4 I_{zk} = 4mA$

$E = E_{MAX} = 12V \quad \wedge \quad I_U = I_{UMAX} = 100mA$

$P_E = E_{MAX} I_{EMAX}$

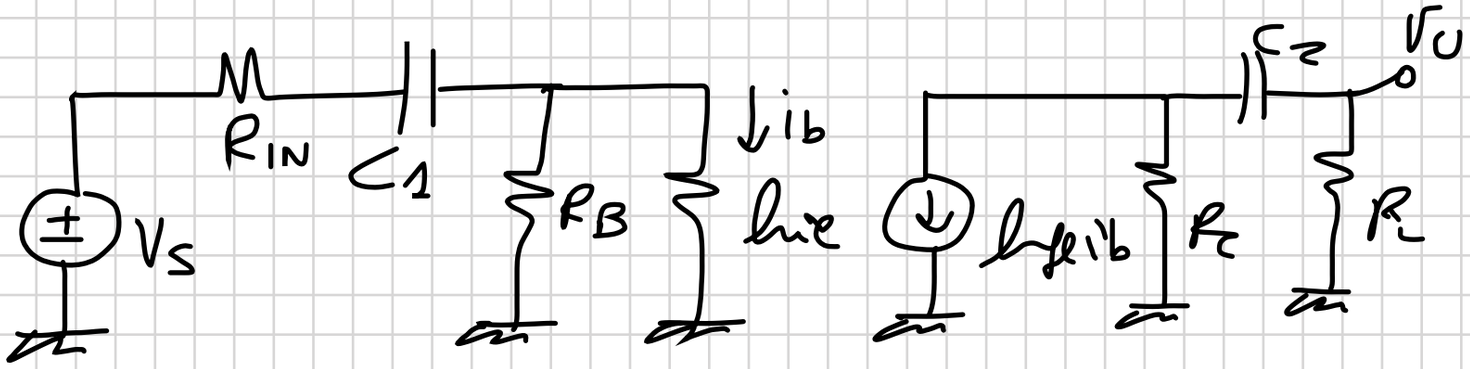
$$I_{E_{MAX}} = \frac{E - V_{z0}}{R + r_z} + \frac{r_z}{r_z + R} I_U$$

$$P_E = E_{MAX} \left(\frac{E - V_{z0}}{R + r_z} + \frac{r_z}{r_z + R} I_U \right)$$

$E = E_{min} \; ; \quad I_U = I_{UMAX}$

$$I_1 = \frac{E_{MIN} - V_{z0}}{R + r_z} - \frac{R}{R + r_z} I_U > 4 I_{zk}$$

$R = 40{,}23\Omega$

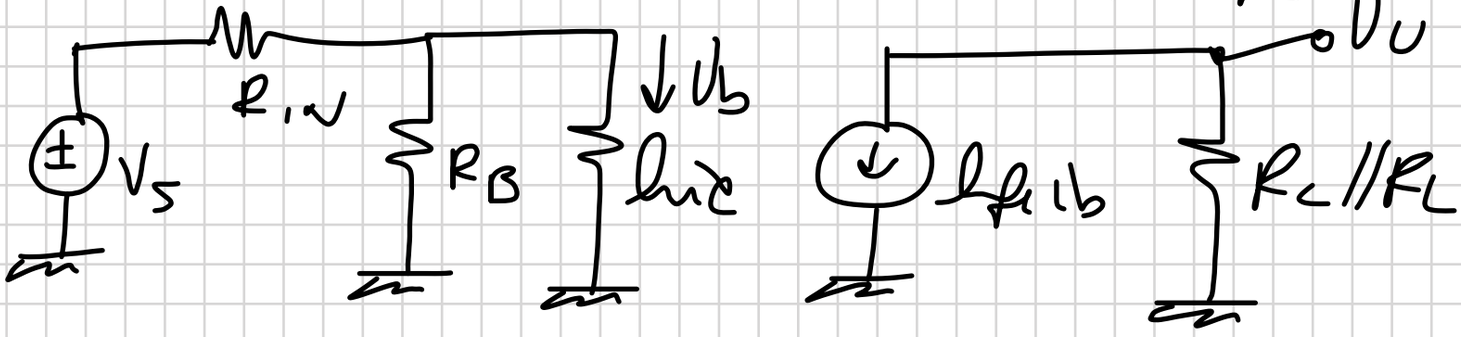


$$A_f(s) = \frac{V_U}{V_S} = \frac{k\, s^2}{\left(\frac{s}{\omega_{p1}} + 1\right)\left(\frac{s}{\omega_{p2}} + 1\right)}$$

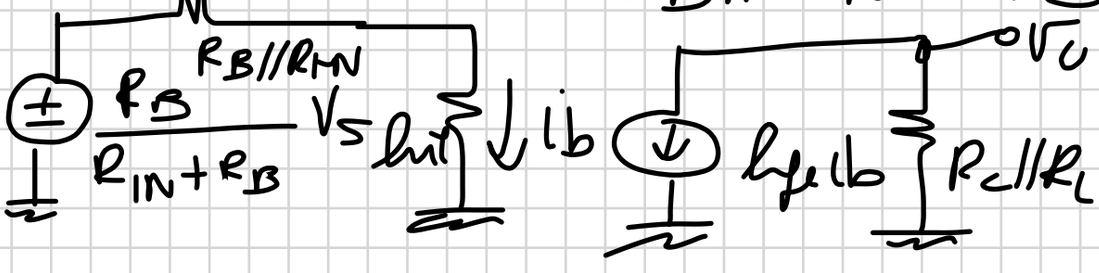
$$\omega_{p1} = \frac{1}{C_1 R_{VC1}} \qquad R_{VC1} = R_{IN} + R_B // h_{ie}$$

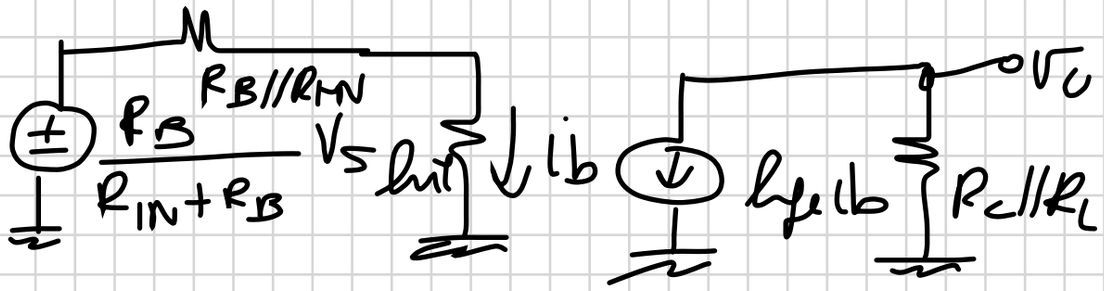
$$\omega_{p2} = \frac{1}{C_2 R_{VC2}} \qquad R_{VC2} = R_C + R_L$$

$$A_{f\infty} = k\, \omega_{p1} \omega_{p2} \Rightarrow k = \frac{A_{f\infty}}{\omega_{p1} \omega_{p2}}$$



$$A_{f\infty} = -\frac{R_C // R_L\, h_{fe}}{h_{ie} + R_B // R_{IN}} \cdot \frac{R_B}{R_B + R_{IN}}$$





$$V_U = - R_C // R_L \; h_{fe} i_b$$

$$i_b = \frac{V_S \; R_B}{R_B + R_{IN}} \cdot \frac{1}{R_B // R_{IN} + h_{ie}}$$

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