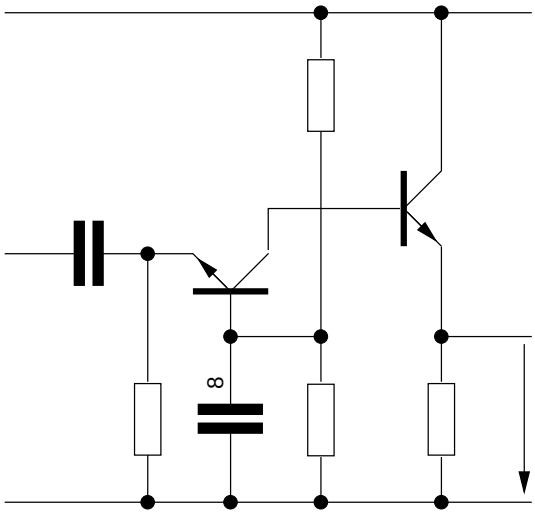
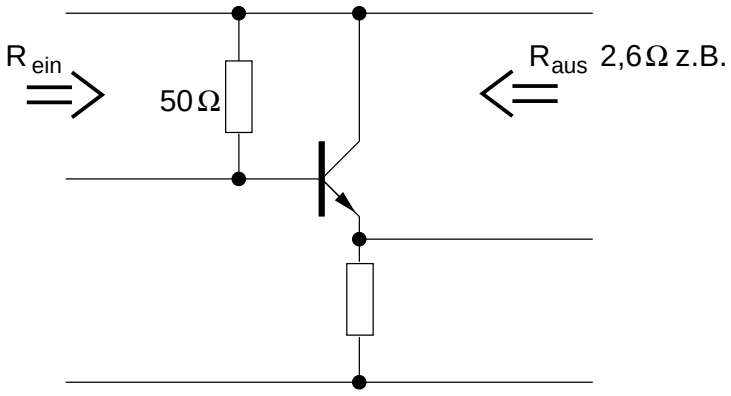
Aufgabe A)

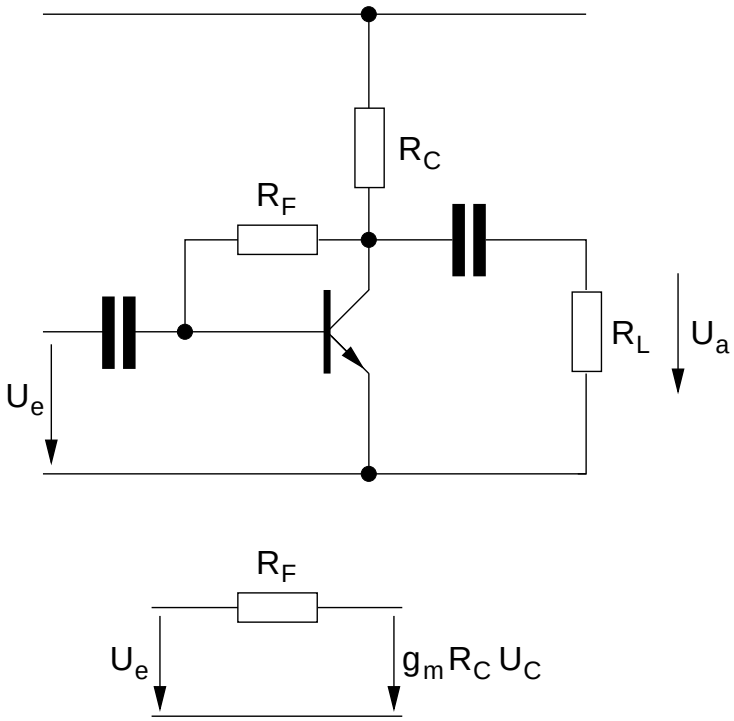
	EGS	**KGS**	**BGS**
R_{ein}	$\beta r_e + r_b$	$\beta(R_L + r_e) + r_e$	$r_e + \frac{r_b}{\beta}$
	mittel	gross	klein
R_{aus}	$\infty \left(\frac{1}{g_0}\right)$	$\frac{R_G + r_b}{\beta} + r_e$	$\infty \left(\gg \frac{1}{g_0}\right)$
	gross	klein	sehr gross

Teil C): Kombination von BGS + KGS, oder als Schaltung mit einem Transistor





oder als rückgekoppelte Schaltung:



$$R_{ein} = \frac{U_e R_F}{U_e(1 + g_m R_C} = \frac{R_F}{1 + g_m R_C}$$

Aufgabe B)

$$i_D(t) = I_S e^{\left(\frac{U_0 + \Delta U(t)}{U_T}\right)}$$

$$i_D \approx a_0 + a_1 \Delta u + a_2 \Delta u^2 + a_3 \Delta u^3$$

$$\Delta u = u cos(\omega_u t) + v cos(\omega_v t)$$

siehe Skript S. 87ff

Aufgabe C)

$$U_2 = -U_1 g_m Z_L \qquad Z_L = R_L \parallel C_L = \frac{R_L \frac{1}{j\omega C_L}}{R_L + \frac{1}{j\omega C_L}} = \frac{R_L}{j\omega C_L R_L + 1}$$

$$= -U_1 \frac{g_m R_L}{1 + j\frac{\omega}{\omega_0}} \qquad \text{mit } \omega_0 = \frac{1}{R_L C_L}$$

$$\Rightarrow \frac{U_2}{U_1} = -\frac{g_m R_L}{1 + j\frac{\omega}{\omega_0}}$$

$$\begin{aligned} g_m &= \frac{I_C}{U_T} = \frac{I_S e^{\frac{U_{be}}{U_T}}}{U_T} \\ &= \frac{10^{-16} e^{\frac{800}{26}} A}{26mV} = 0,0887 \end{aligned}$$

$$\begin{aligned} \frac{1}{\omega_0} = \frac{1}{2\pi f_0} &= R_L C_L \\ \Rightarrow f_0 &= \frac{1}{2\pi R_L C_L} \end{aligned}$$

$$\begin{aligned} f_0(R_L = 10\Omega) &= 160GHz \\ f_0(R_L = 100\Omega) &= 16GHz \\ f_0(R_L = 1000\Omega) &= 1,6GHz \end{aligned}$$

$$\begin{aligned} 20log(g_m R_L(10\Omega) &= -1dB \\ 20log(g_m R_L(100\Omega) &= 18,9dB \\ 20log(g_m R_L(1000\Omega) &= 39dB \end{aligned}$$