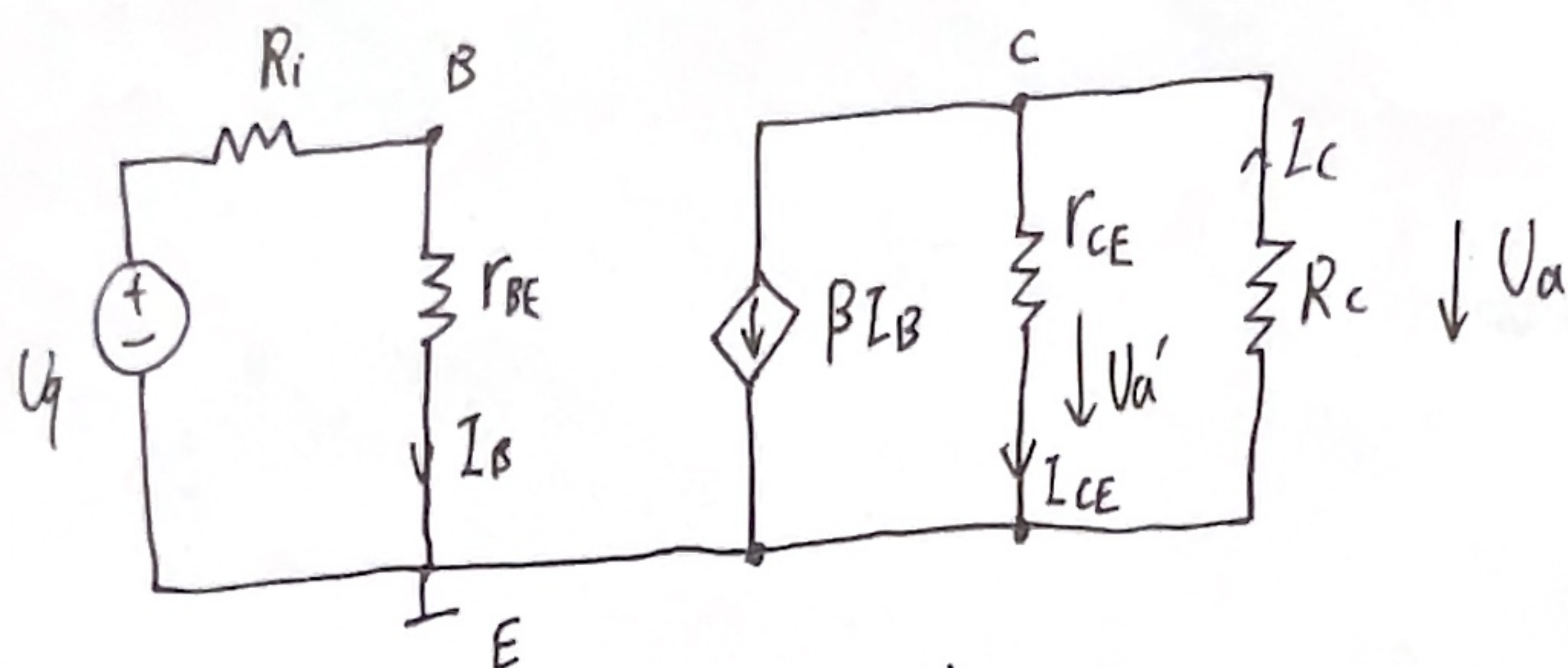


Aufgabe 9

Zeichne - T Kleinsignalersatzschaltbild für niedrige Frequenzen eines Verstärkers

$R_i > 0, R_c > 0, r_{BE} > 0, r_{CE} > 0$, idealen festen Spannungsquelle U_q
stromgesteuerte Stromquelle βI_B



f Frequenzgang $H(j\omega) = \frac{U_a}{U_q}$ & Stromverstärkung $A_v = \frac{I_C}{I_B}$

$$I_B = U_q \frac{1}{R_i + r_{BE}}, \quad I_C = \beta I_B \frac{r_{CE}}{r_{CE} + R_c} \Rightarrow A_v = \frac{I_C}{I_B} = \beta \frac{r_{CE}}{r_{CE} + R_c}$$

parallel

$$U_q = I_B (R_i + r_{BE}), \quad U_a = -I_C R_c = -\beta I_B \frac{R_c r_{CE}}{r_{CE} + R_c}$$

$$H(j\omega) = \frac{U_a}{U_q} = - \frac{\beta I_B \frac{R_c r_{CE}}{r_{CE} + R_c}}{I_B (R_i + r_{BE})} = - \beta \frac{R_c r_{CE}}{(r_{CE} + R_c)(R_i + r_{BE})}$$

$$H'(j\omega) = \frac{U_a'}{U_q}$$

$$U_a' = I_{CE} \cdot r_{CE} = \frac{R_c}{r_{CE} + R_c} \beta I_B \cdot r_{CE}, \quad U_q = (R_i + r_{BE}) I_B$$

parallel

$$H'(j\omega) = - \frac{R_c \beta I_B \cdot r_{CE}}{(R_c + r_{CE})(R_i + r_{BE}) I_B} = - \frac{\beta R_c r_{CE}}{(R_c + r_{CE})(R_i + r_{BE})}$$