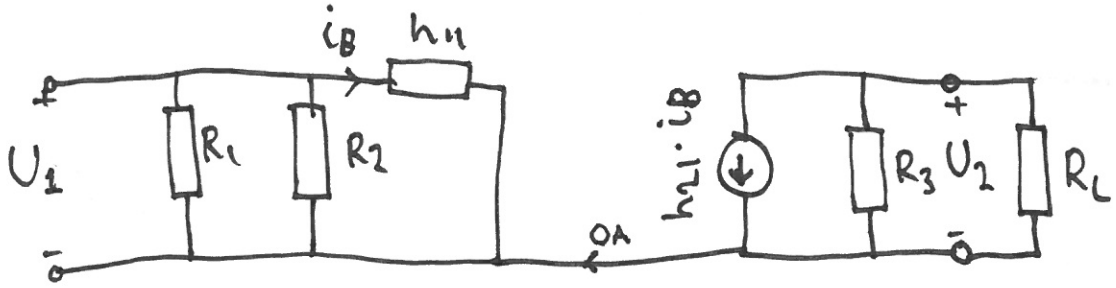
E-12) Småsignalschema



$R_1 = 40\,k\Omega$
$R_2 = 20\,k\Omega$
$R_3 = 4{,}0\,k\Omega$
$R_4 = 1.0\,k\Omega$
$R_L = 6.0\,k\Omega$

$h_{11} = 500\,\Omega$
$h_{12} \approx 0$
$h_{21} = 39$
$h_{22} \approx 0$

$$F = \frac{U_2}{U_1} = \frac{-h_{21} \cdot i_B \cdot \frac{R_3 \cdot R_L}{R_3 + R_L}}{h_{11} \cdot i_B} = \frac{-h_{21}}{h_{11}} \cdot \frac{R_3 \cdot R_L}{R_3 + R_L}$$

$$= \frac{-39}{500} \cdot \frac{4k \cdot 6k}{4k + 6k} = -1\,87$$

$$\boxed{F = -1\,87}$$

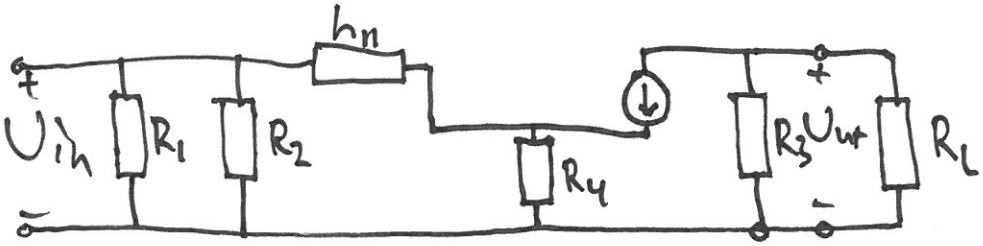
$$Z_{in} = R_1 // R_2 // h_{11} = \frac{R_1 \cdot R_2 \cdot h_{11}}{R_1 \cdot R_2 + R_1 \cdot h_{11} + R_2 \cdot h_{11}} = 482\,\Omega$$

$$\boxed{Z_{in} = 482\,\Omega}$$

$$Z_{ut} = R_3 = 4.0\,k\Omega$$

$$\boxed{Z_{ut} = 4.0\,k\Omega}$$

Utan emitter avkoppling:



$$F = \frac{U_{ut}}{U_{in}} = \frac{-h_{21} \cdot i_B \cdot \frac{R_3 \cdot R_L}{R_3 + R_L}}{i_B \cdot h_{11} + (i_B + h_{21} \cdot i_B) \cdot R_4} = \frac{-h_{21} \cdot \frac{R_3 \cdot R_L}{R_3 + R_L}}{h_{11} + (1 + h_{21}) \cdot R_4} =$$

$$= \frac{-39 \cdot 2400}{500 + 40 \cdot 1000} = -2.31$$

$$\boxed{F = -2.31}$$