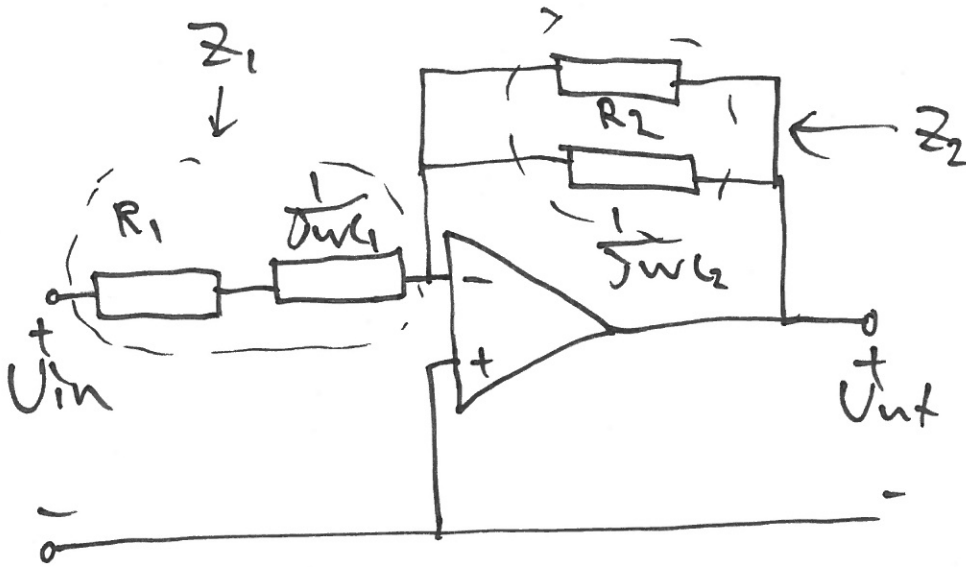


F-2.3) komplex schema

$R_1 = 10\text{k}\Omega, R_2 = 10\text{k}\Omega$
 $C_1 = 100\text{nF}, C_2 = 1\mu\text{F}$



$$Z_1 = R_1 + \frac{1}{j\omega C_1}$$

$$= \frac{1 + j\omega C_1 R_1}{j\omega C_1}$$

$$Z_2 = \frac{R_2 \cdot \frac{1}{j\omega C_2}}{R_2 + \frac{1}{j\omega C_2}}$$

$$= \frac{R_2}{1 + j\omega C_2 R_2}$$

$$F = \frac{U_{out}}{U_{in}} = \frac{-Z_2}{Z_1}$$

$$= - \frac{R_2}{1 + j\omega C_2 R_2} \cdot \frac{j\omega C_1}{1 + j\omega C_1 R_1} = - \frac{10\text{k}}{1 + j \cdot \omega \cdot 1 \cdot 10\text{k}} \cdot \frac{j \cdot \omega \cdot 100\text{n}}{1 + j \omega 100\text{n} \cdot 10\text{k}}$$

$$= - \frac{j \cdot \omega / 1000}{1 + j \cdot \omega / 1000} \cdot \frac{1}{1 + j \cdot \omega / 10000}$$

$$|F| = \frac{\omega / 1000}{\sqrt{1^2 + \left(\frac{\omega}{1000}\right)^2}} \cdot \frac{1}{\sqrt{1^2 + \left(\frac{\omega}{10000}\right)^2}}$$

$\omega_u = 1000 \Rightarrow f_u = \frac{1000}{2\pi} = 159\text{Hz}$

$\omega_D = 100000 \Rightarrow f_D = \frac{100000}{2\pi} = 15.9\text{kHz}$

