

# task\_c9fj1si7l797equs\_with\_calculation

## Student Group

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impedance, phasor, cutoff, exam ee1 SS2023

**Exercise E2 Complex voltage dividers**  
**(written test, approx. 16 % of a 60-minute written test, SS2023)**

**Task:** Calculate the two impedances  $Z_1$  and  $Z_2$  in the circuit below resulting in a phase shift between impedance  $Z_1$  and  $Z_2$  of  $90^\circ$ . Choose an appropriate scaling factor and write it down.

- $R = 1.1 \text{ k}\Omega$

Solution:  $L = 3.5 \text{ mH}$

**Result:**

$$\underline{U}_I = 5 \text{ V}$$

$$\underline{U}_O = 0.5 \text{ V} - j \cdot 1.5 \text{ V}$$

The cutoff frequency is the absolute value of the impedance  $Z_1$  is equal to  $R = 1.1 \text{ k}\Omega$ . This leads to  $\omega = \frac{1}{RC} = \frac{1}{1.1 \cdot 10^3 \cdot 3.5 \cdot 10^{-3}} = 260 \text{ rad/s}$ .  
 The cutoff frequency is the absolute value of the impedance  $Z_2$  is equal to  $R = 1.1 \text{ k}\Omega$ . This leads to  $\omega = \frac{1}{RC} = \frac{1}{1.1 \cdot 10^3 \cdot 3.5 \cdot 10^{-3}} = 260 \text{ rad/s}$ .

.. Calculate the impedance  $Z_L$ .

Solution

$$\underline{Z}_L = j \cdot \omega \cdot L = j \cdot 2\pi \cdot 150 \text{ kHz} \cdot 3.5 \text{ mH}$$

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