

# task\_c9fj1si7l797equs\_with\_calculation

## Student Group

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### Exercise E1 Complex voltage dividers

(written test, approx. 16 % of a 60-minute written test, SS2023)

1. Derive the two impedances  $\underline{Z}_L$  and  $\underline{Z}_C$  for the circuit below. Choose an appropriate scaling factor and write it down.

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

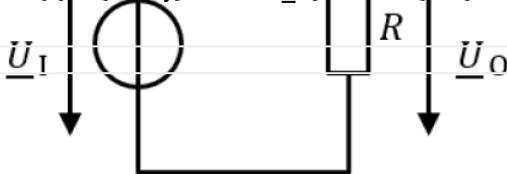
Solution  $L = 3.5 \text{ mH}$

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

$$\underline{Z}_L = 50 \text{ m}\Omega$$

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

At the cutoff frequency the absolute values of impedances  $|\underline{Z}_L|$  is equal to  $|\underline{Z}_C|$ . This leads to  $\frac{1}{\omega C} = R$   $\Rightarrow \omega = \frac{1}{RC}$   $\Rightarrow f = \frac{1}{2\pi RC}$   $\Rightarrow f = \frac{1}{2\pi \cdot 1.1 \text{ k}\Omega \cdot 10^{-6} \text{ F}}$   $\Rightarrow f \approx 72.9 \text{ kHz}$



.. Calculate the impedance  $\underline{Z}_L$ .

Solution

$$\underline{Z}_L = j \omega L = j \cdot 2\pi \cdot 72.9 \text{ kHz} \cdot 3.5 \text{ mH} = j \cdot 1.77 \text{ k}\Omega$$

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