

task_c9fj1si7l797equs_with_calculation

Student Group

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impedance, phasor, cutoff, exam ee1 SS2023

Exercise E12 Complex voltage dividers
(written test, approx. 16 % of a 60-minute written test, SS2023)

1. Calculate the two impedances \underline{Z}_L and \underline{Z}_C in this circuit. The resulting phasor for the beta impedance \underline{Z}_L is $\underline{U}_O = 0.5 \text{ V} - j \cdot 1.5 \text{ V}$. Choose an appropriate scaling factor and write it down.

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

Solution $L = 3.5 \text{ mH}$

Result:

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

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

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

The cutoff frequency is the absolute value of the impedance \underline{Z}_L is equal to $R = 1.1 \text{ k}\Omega$. This leads to $f_c = \frac{1}{2\pi RC} = \frac{1}{2\pi \cdot 1.1 \cdot 10^3 \cdot 10^{-6}} \approx 150 \text{ kHz}$. However, $R = 1.1 \text{ k}\Omega$ is not $1.1 \text{ k}\Omega$ but $1.1 \text{ }\Omega$.

.. Calculate the impedance \underline{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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