Exercise Worksheet 1

26. Oktober 2011

Exercise 1

Part A

A sinusoidal voltage source with the peak value $\hat{u} = 310V$ and a frequency of $50Hz$ is connected to a 50Ω resistor. Calculate the current $i(t)$ at the time

- 2.5ms
- 10ms
- 12ms
- 15ms.

Part B

Calculate the effective value of this voltage.

Exercise 2

Part A

Two complex numbers are given:

$$\underline{Z}_1 = 2 + j8 \qquad \underline{Z}_2 = 5 + j9$$

Convert these numbers into polar coordinates representation.

Part B

These complex numbers are given:

$$\underline{Z}_1 = 3 + j3 \qquad \underline{Z}_2 = 4 + j5$$

solve the following problems:

$$\underline{Z} = \underline{Z}_1 + \underline{Z}_2$$

$$\underline{Z} = \underline{Z}_1 - \underline{Z}_2$$

$$\underline{Z} = \underline{Z}_1 \cdot \underline{Z}_2$$

$$\underline{Z} = \frac{\underline{Z}_1}{\underline{Z}_2}$$

Exercise 3

An electrical heater has an resistance of 26.45Ω. It is connected to a 230V power outlet via an 100m long copper cabel (cross section $1.5mm^2$)

Question:

What electrical voltage can I measure accross the heater resistance ? Calculate the power consumption of the heater.

The specific resistance for copper is $\rho = 1.68 \cdot 10^{-2} \frac{\Omega mm^2}{m}$

Exercise 4

Calculate the reactances (X_L or X_C) of the following inductivities and capacities:

- $L = 25mH$ @ $f = 50Hz$
- $L = 400\mu H$ @ $f = 200Hz$
- $C = 100\mu F$ @ $f = 50Hz$
- $C = 2.2\mu F$ @ $f = 500Hz$

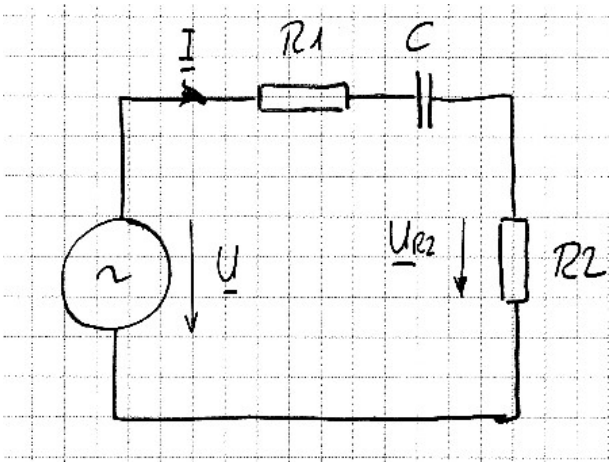

Abbildung 1: Complex Circuit

Exercise 5

The circuit has the following component values.

- $\underline{U} = 220V$
- $R1 = 400\Omega$
- $R2 = 200\Omega$
- $C = 10.61\mu F$
- $f = 50Hz$

Part A

Determine the voltage $\underline{U}_{R2}$

Part B

Draw a vector diagram of all voltages and currents.