12. Internationale Elektrotechnik-Olympiade der Schulen der Euroregion Neisse

NEISSE - ELEKTRO 2000

Name:----------

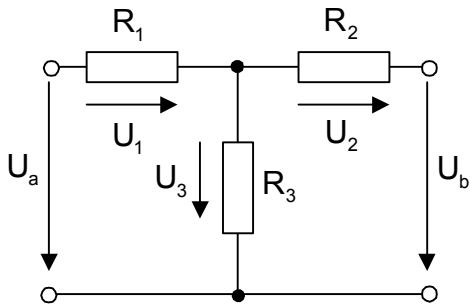
1	2	3	4	5	Σ

Tasks for the finale
90 min ; with formulary (english edition)

1

$U_a = 12V$
$U_b = 10V$
$R_1 = 10\Omega$
$R_2 = 20\Omega$
$R_3 = 5\Omega$

Calculate the voltages U_1, U_2, U_3!

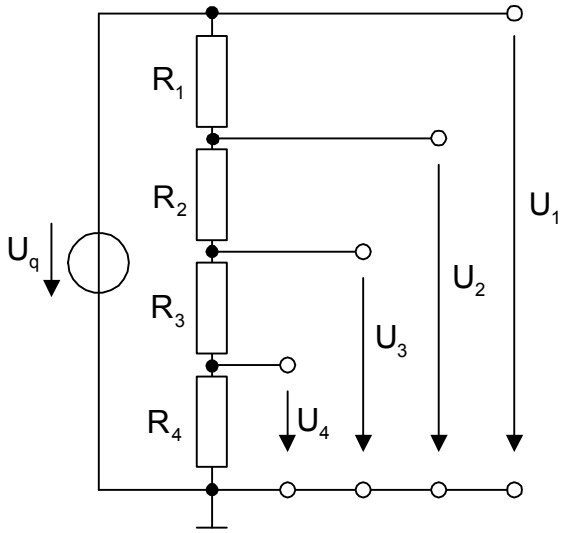


2

$R_1 = 10k\Omega$
$U_1 = 10V; U_2 = 1V;$
$U_3 = 0.1V; U_4 = 0.01V$

a)
Calculate the values of R_2; R_3; R_4!

b)
Calculate the resistor, that loads the voltage source!

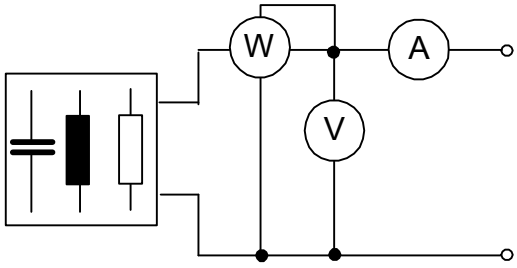


3

The circiut is supplied by ac voltage (frequency $f = 50\text{Hz}$). The measuring instruments show:

$U = 48\text{V}$ $I = 2{,}2\text{A}$ $P = 79{,}2\text{W}$

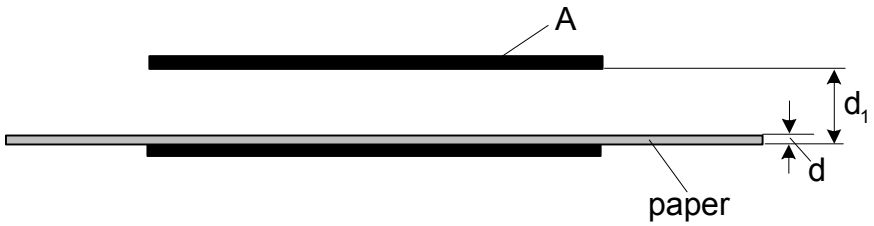
Describe the behavior of the circuit with the help of 2 electronic devices and calculate their values!



4

A sheet of paper ($\varepsilon_r = 2{,}3$) is put into a plate capacitor (area $A = 0{,}4\text{m}^2$, distance $d_1 = 3\text{mm}$, permittivity (vacuum) $\varepsilon_0 = 8{,}85 \cdot 10^{-12}\,\text{As/Vm}$). The measured capacity is $C = 4{,}0\text{nF}$.

Calculate the thickness d of the paper!



5

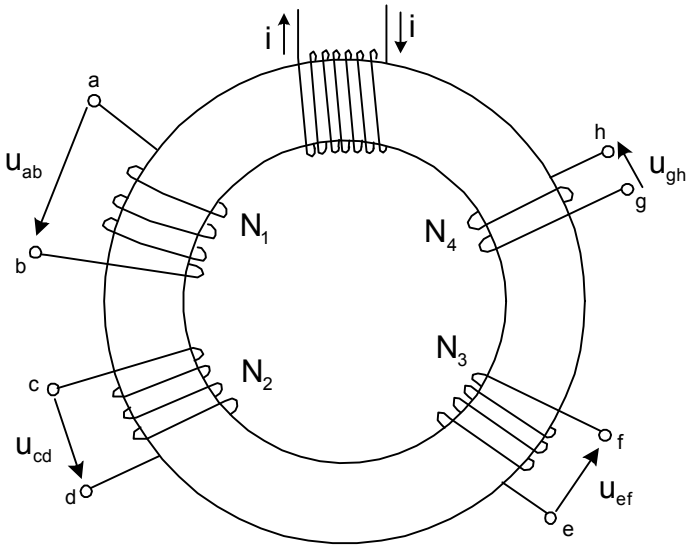
The magnetic flux Φ in the given iron core is produced by the field coil (number of windings N_0) with current i:

$\Phi(t) = 20 \cdot 10^{-4}\,\text{Vs} \cdot \sin\omega t$

with frequency $f = 50\text{Hz}$

$N_0 = 200$ $N_1 = 10$ $N_2 = 20$

$N_3 = 33$ $N_4 = 4$



a)

Calculate the magnetic resistor R_m of the iron core. The current in the field coil is given by:

$i = 20\text{mA} \cdot \sin\omega t$

b)

Calculate the voltages u_{ab}, u_{cd}, u_{ef} and u_{gh}!