22. Internationale Elektrotechnik-Olympiade der Schulen der Euroregion Neisse

NEISSE - ELEKTRO 2016

Name:.....

1	2	3	4	5	Σ

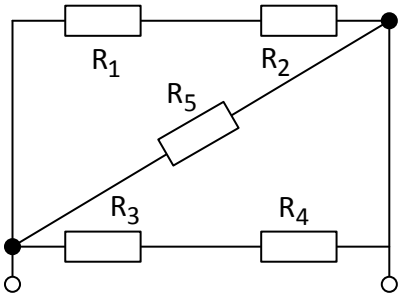
Tasks for the finale
90 min ; with formulary (english edition)

1

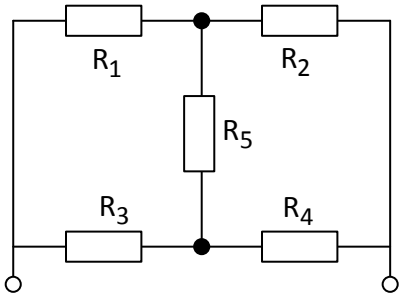
Calculate for the circuit a) and b) the total resistance.

$R_1 = 20\ \Omega$
$R_2 = 80\ \Omega$
$R_3 = 3\ \Omega$
$R_4 = 4\ \Omega$
$R_5 = 5\ \Omega$

a)

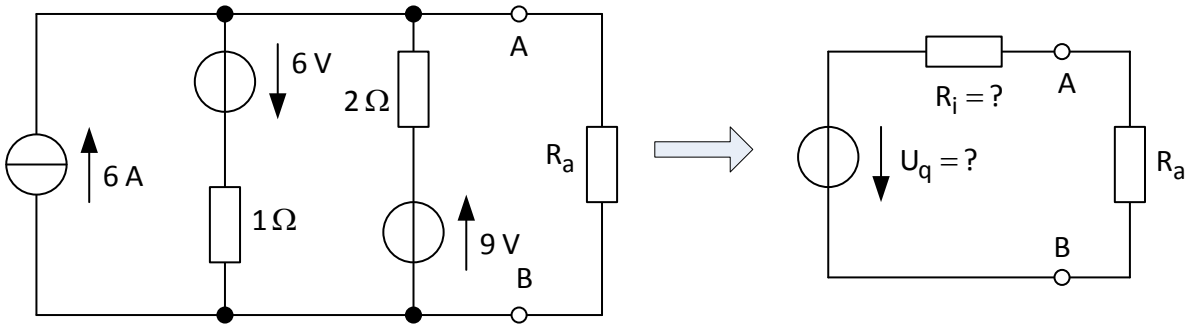


b)



2

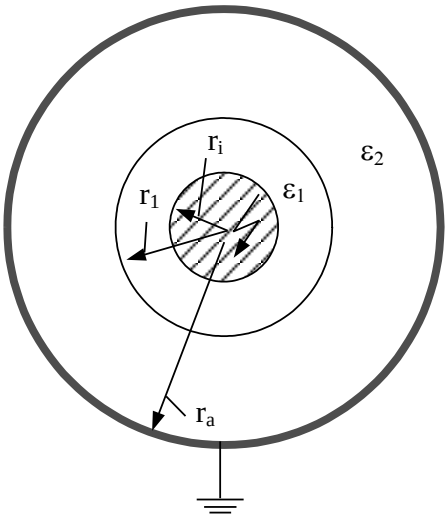
The left circuit is given. Transform it in the right circuit and calculate U_q , R_i and the minimum of R_a to have maximum current of 1,0 A in the circuit.



3

A high voltage cable with a two layer insulation according to the figure can be considered as two cylindrical capacitors with the following parameters:
U = 20 kV, f = 50 Hz
length of the cable l = 1 km

r_a = 5 cm
r_i = 2 cm
r_1 = 3 cm
ε_{r1} = 3
ε_{r2} = 1



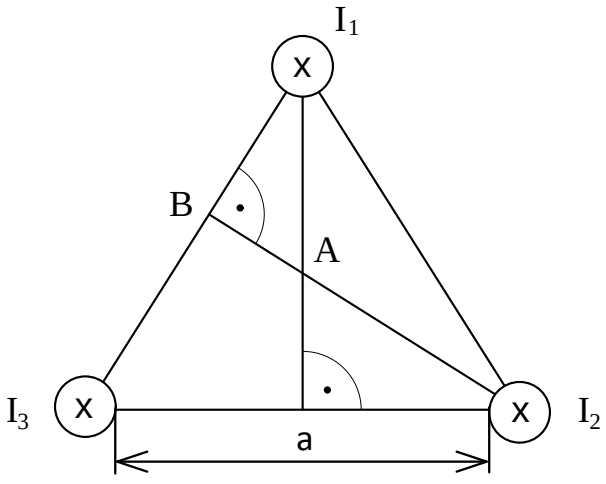
a) Calculate the capacitances C_{total}, C_1 and C_2 of this cable!

b) Calculate the electrical charge $Q = Q_1 = Q_2$ of this cable!

c) Calculate the voltage over each layer of the insulation U_1 and U_2!

4

Three parallel very thin conductors create a equilateral triangle (see figure).
Calculate the magnetic field intensity H in the point A and B of this high voltage bundle conductor with a current in each conductor of $I_1 = I_2 = I_3 = 100$ A. The distance between conductors is a = 35 cm.



5

A black box containing two basic circuit elements (R, L or C) is supplied by an AC voltage of U = 24 V (f = 50 Hz) and a current of I = 1,1 A.
The measured reactive power is Q = 17,5 var.

Describe the black box behaviour by a drawing of these two basic circuit elements (R, L or C) and calculate their values!