NEISSE-ELEKTRO 2021

Name:

School:

1	2	3	4	5	Σ

Tasks for the finale; 90 min; with formulary (English edition)
Please use a separate sheet of paper for each task.
Write your name and school on each of these papers.

Task 1 (20 points)
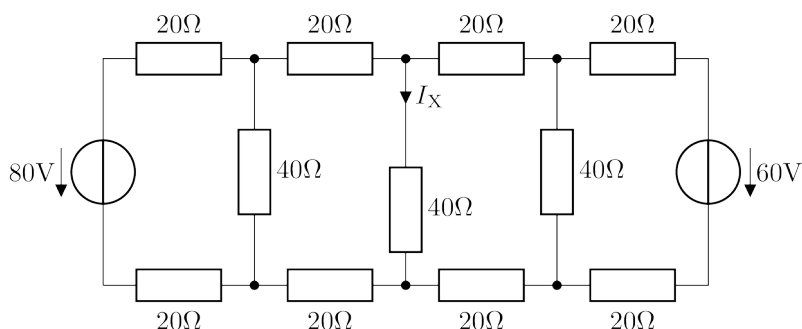Calculate the current I_X in the schematic figure 1.

figure 1

Task 2 (20 points)
A number of 85 lamps, each with a power of 40 W, are connected in parallel to a voltage of 230 V. When a group of lamps is switched off, the total resistance of the circuit <u>increases</u> by 50 Ω.

How many lamps are still on?

Task 3 (20 points)
A toroidal core of constant permeability has an air gap of 1.5 mm. A winding of 850 turns is applied to the core. A flux density of 0.45 Tesla prevails in the air gap.

By how many amperes does the current through the coil have to be increased, if the width of the air gap is doubled, while the flux density remains the same.

Task 4 (20 points)
The two capacitors C1 and C2 are connected to a battery, the poles of which have a voltage of +/-100 V to earth (figure 2).

What amount of charge flows into the arrangement if the connection of the capacitors is also grounded?
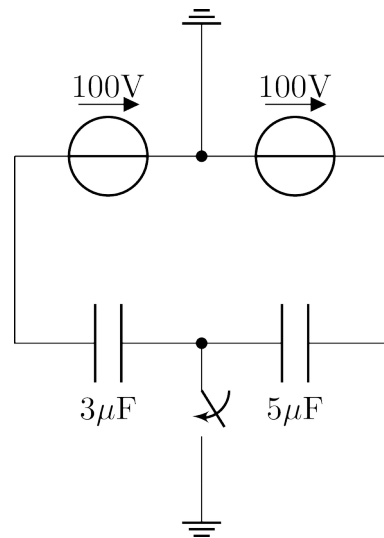

figure 2

Task 5 (20 points)
A transformer with with U_{in} = 230 V and U_{out} = 12 V was connected to a halogen lamp with P = 40 W. You replace the halogen lamp with a 6 W LED module. Then you measure a voltage of U_{out} = 15 V. Because of the lower current, the voltage U_{out} increases. Think of an ideal transformer and a winding resistance $R_{transformer}$ in series to the output.

a) Draw the schematic and mark voltages and currents.
b) Calculate the inner resistance $R_{transformer}$ of the output winding.
c) Calculate the currents I_{in} for the 40 W and 6 W load.
d) Calculate the effectivenesses η of the circuit for the lamp and the LED module.