

task_cgeyprm6oboukcci_with_calculation

Student Group

First Name	Surname	Matrikel Nr.

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Exercise E2 Pure Resistor Network Simplification

(written test, approx. 12 % of a 60-minute written test, SS2023)

The circuit below voltage at node K , when switch S is closed.

Result

The values in the circuit are

Solution

- $R_1 = 60 \, \Omega$

- $R_2 = 40 \, \Omega$

- $R_3 = 10 \, \Omega$

The voltage divider for K has the same proportionality as the voltage divider for A . Therefore, the potential of K is the same as for A .

There will be no current flow through R_3 . The resistance does not create a voltage drop and therefore does not interfere with the circuit.

1. Calculate the voltage at node K , when switch S is open.
It might be beneficial to redraw the circuit first.

Solution

Rearranging the circuit one can get:

Once the switch S is opened, the upper part is a parallel circuit. Therefore, R_{eq} is given as:

$$R_{\text{eq}} = (R_1 + R_2) \parallel (R_1 + R_2) + R_4$$

$$= \frac{1}{2} \cdot (R_1 + R_2) + R_4 = \frac{1}{2} \cdot (60\,\Omega + 40\,\Omega) + 100\,\Omega$$

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