

# task\_x357drkaqv84jnsc\_with\_calculation

## Student Group

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resistivity, power, heat, exam WS2022

## Exercise 1 : Pure Resistor Network Simplification

(written test, approx. 13% of a 60-minute written test, WS2022)

The following circuit with  $R_1=200 \text{ }\Omega$ ,  $R_2=R_3=100 \text{ }\Omega$  and the switch  $S$  is given.

1. The switch shall now be open. Calculate the equivalent resistance  $R_{eq}$  between  $A$  and  $B$ .

Solution

$$\begin{aligned} R &= R_0 \cdot (1 + \alpha \cdot \Delta T + \beta \cdot \Delta T^2) \quad \& \mid \\ \text{with } T &= T_{end} - T_{start} \quad R = 10 \text{ k}\Omega \cdot (1 + 0.01 \frac{1}{K}) \cdot (-40^\circ\text{C} - 25^\circ\text{C}) + 71 \cdot 10^{-6} \frac{1}{K^2} \cdot (-40^\circ\text{C} - 25^\circ\text{C})^2 \end{aligned}$$

## Final result

$$R = 6.5 \text{ k}\Omega$$

2. The switch shall now be closed. Calculate the equivalent resistance  $R_{eq}$  between  $A$  and  $B$ .

## Solution

Resistors transfer electrical energy out of the circuit and generate heat. Therefore, a resistive sensor might heat up the refrigeration system.

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Last update: **2023/02/11 23:33**

