

# task\_erlctd760zmvox0t\_with\_calculation

## Student Group

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network simplification, exam ee1 SS2023

**Exercise E1 Pure Resistor Network Simplification I**  
**(written test, approx. 14 % of a 60-minute written test, SS2023)**

The circuit below should be given as  $U_{\text{AB}} = 60 \text{ V}$ . What is the value for  $R_{\text{eq}}$  the circuit?

Solution

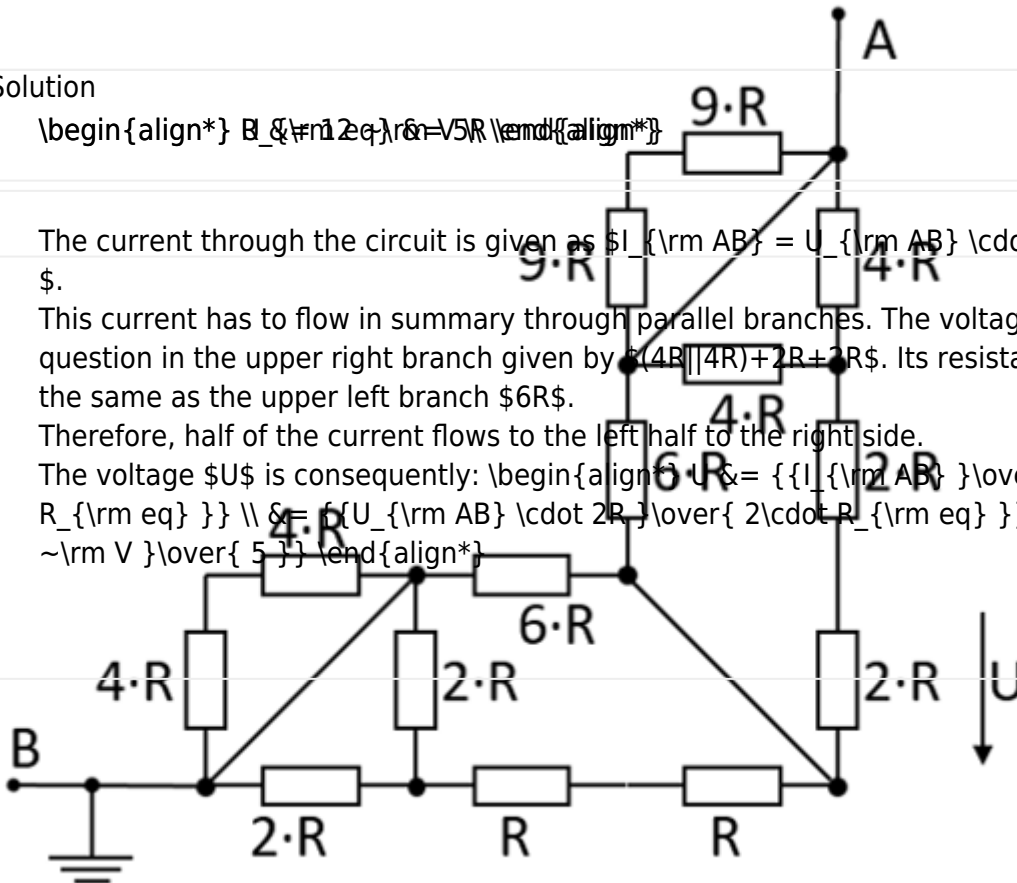
$$I_{\text{AB}} = \frac{U_{\text{AB}}}{R_{\text{eq}}} = 6 \text{ A}$$

The current through the circuit is given as  $I_{\text{AB}} = \frac{U_{\text{AB}}}{R_{\text{eq}}}$ .

This current has to flow in summary through parallel branches. The voltage  $U$  in question in the upper right branch given by  $(4R \parallel 4R) + 2R + 2R$ . Its resistance is just the same as the upper left branch  $6R$ .

Therefore, half of the current flows to the left half to the right side.

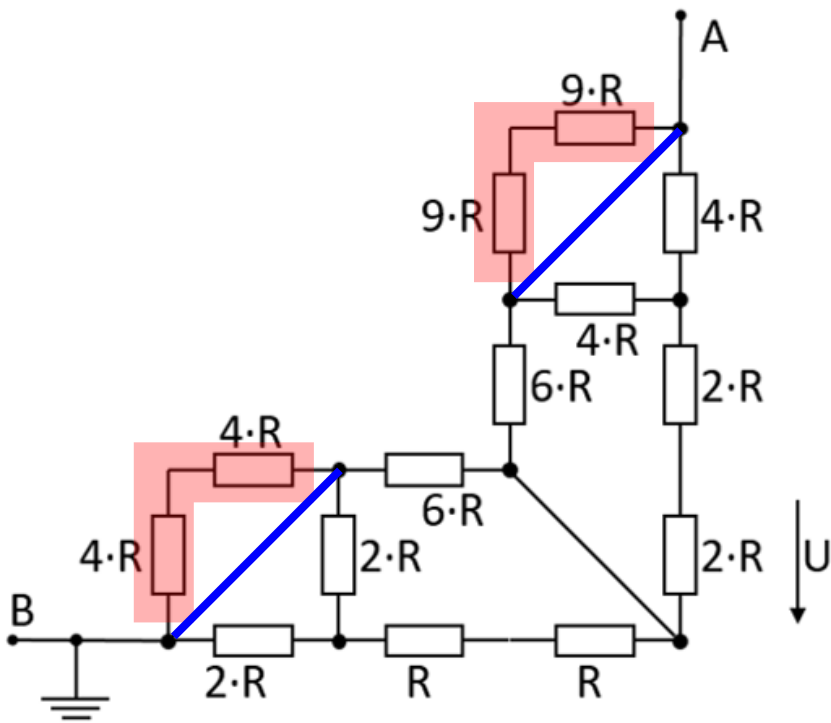
$$U = \frac{I_{\text{AB}} \cdot R_{\text{eq}}}{2} = \frac{6 \text{ A} \cdot R_{\text{eq}}}{2} = 3 R_{\text{eq}}$$



1. What is the equivalent resistance  $R_{\text{eq}}$ ?

Solution

Part of the circuit is shorted. Here the resistors (marked in red) are shorted by the connections marked in blue:



The circuit can then be rearranged for better interpretation:

Therefore,  $R_{\text{eq}}$  is given as: 
$$R_{\text{eq}} = (2R || 2R + R +$$

$$R + 6R + (2R + 2R + 4R) = (R + R + R) + 6R + (2R + 2R + 2R) \\ = 3R + 6R + 6R = \frac{3R \cdot 6R}{3R + 6R} + 3R$$

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