

# task\_w3wf215v2u98ty07\_with\_calculation

## Student Group

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efficiency, charges, power, exam ee1 SS2023

Exercise E17 Efficiency

(written test, approx. 14 % of a 60-minute written test, SS2023)

A. (10 points) A battery with an open-circuit voltage  $U_S = 3.5 \text{ V}$  and an internal resistance  $R_i = 2 \text{ }\Omega$  is connected to a load resistor  $R_L = 30 \text{ }\Omega$ . The battery shall provide energy for a device with an load resistance of  $R_L = 2 + 10 \text{ }\Omega$ . The following values are from the battery data sheet.

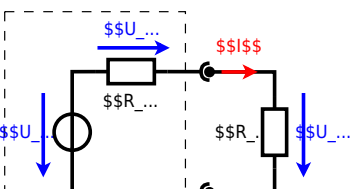
begin{align\*} \dots \end{align\*}

Solution:  $R_L = 2 + 10 = 12 \text{ }\Omega$

• Verify:  $U_S = 3.5 \text{ V}$ ,  $R_i = 2 \text{ }\Omega$ ,  $R_L = 12 \text{ }\Omega$

.. Efficiency:  $\eta = \frac{P_{out}}{P_{in}} = \frac{I^2 R_L}{I^2 (R_i + R_L)} = \frac{R_L}{R_i + R_L} = \frac{12}{2 + 12} = \frac{12}{14} \approx 0.857 = 85.7\%$

Result:  $\eta = 85.7\%$



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