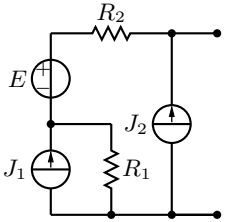
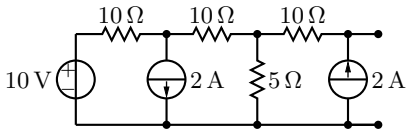
Problem Set 4

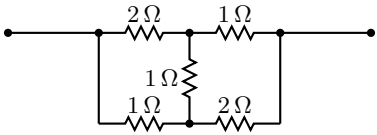
Problem 1. Simplify the following one-ports to their Thévenin's equivalents by successive interchange of Norton's and Thévenin's sources.





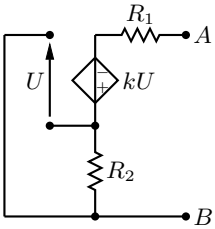
Answer. $E_T = E + J_2(R_1 + R_2) + J_1 R_1$, $R_T = R_1 + R_2$; $E_T = 26\,\mathrm{V}$, $R_T = 14\,\Omega$.

Problem 2. Using formulas for $\Delta - Y$ transformation determine the equivalent resistance of the following one-port.



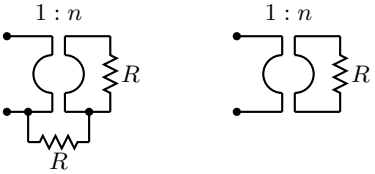
Answer. $\frac{7}{5}\,\Omega$.

Problem 3. Find the equivalent resistance for the one-port with terminals AB.



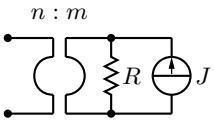
Answer. $R_1 + R_2(1 + k)$.

Problem 4. Compute equivalent resistances for the following one-ports.



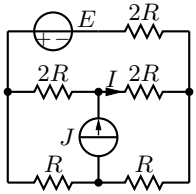
Answer. $R_{\mathrm{eq}} = R/n^2$ for both of the one-ports.

Problem 5. Determine the Norton's source for the following one-port



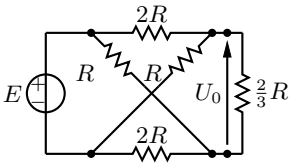
Answer. $J_N = \frac{m}{n}J$, $R_N = \left(\frac{n}{m}\right)^2 R$.

Problem 6. Find the value of current I using Norton's theorem. Assume that $E = 24\,\mathrm{V}$, $J = 1.2\,\mathrm{A}$, $R = 1\,\Omega$.



Answer. $I = \frac{J}{2} + \frac{E}{10R}$.

Problem 7. Compute voltage U_0 using Thévenin's theorem.



Answer. $U_0 = -E/9$.