

Exercices d'application

Branche: Electrotechnique

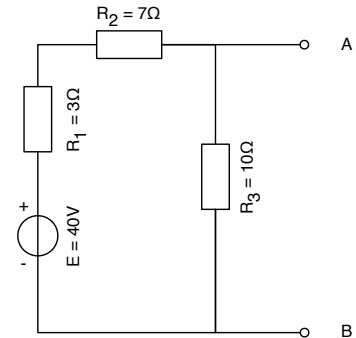
Sujet:

Théorème de Thévenin

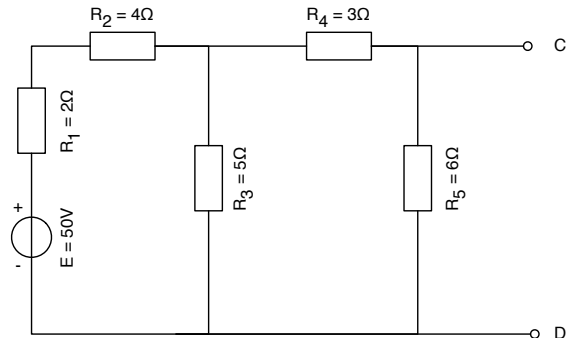
Profession: Electronicien Mult.

Année d'apprentissage: 1^{ère}

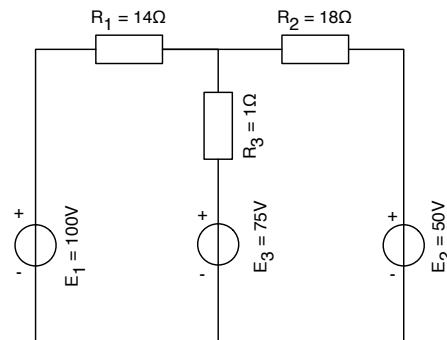
1. Trouver les caractéristiques du générateur équivalent au réseau de la Figure ci-contre:



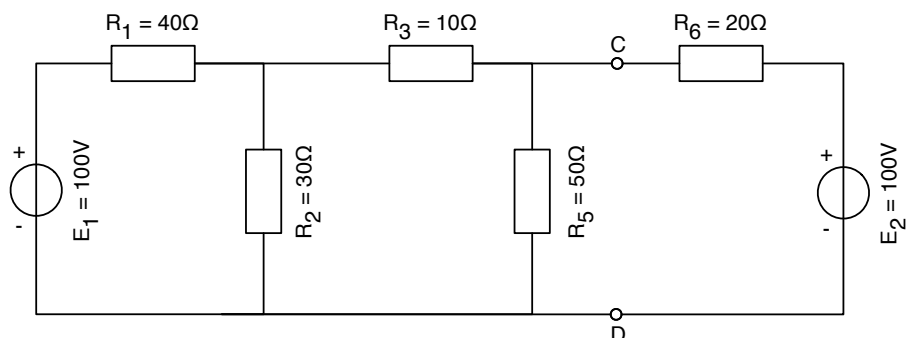
2. Soit le réseau de la figure ci-contre. Calculer la d.d.p. apparaissant entre les points C et D ainsi que la résistance R_{CD} .



3. Soit le réseau de la figure ci-contre. Déterminez le courant I_{R2} .



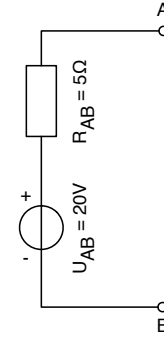
4. Soit le réseau de la figure ci-contre. Calculer la d.d.p. apparaissant entre les points C et D ainsi que la tension sur la résistance R_6 .



1. $R_{1,2} = R_1 + R_2 = 3 + 7 = 10\Omega$

$$R_{AB} = \frac{R_{1,2} * R_3}{R_{1,2} + R_3} = \frac{10 * 10}{10 + 10} = \underline{\underline{5\Omega}}$$

$$U_{AB} = R_3 * \frac{E}{R_1 + R_2 + R_3} = 10 * \frac{40}{3 + 7 + 10} = \underline{\underline{20V}}$$



2. 1ère méthode:

$$R_{1,2} = R_1 + R_2 = 2 + 4 = 6\Omega$$

$$R_{1,2,3} = \frac{R_{1,2} * R_3}{R_{1,2} + R_3} = \frac{6 * 5}{6 + 5} = 2.72\Omega$$

$$R_{1,2,3,4} = R_{1,2,3} + R_4 = 2.72 + 3 = 5.72\Omega$$

$$R_{CD} = \frac{R_{1,2,3,4} * R_5}{R_{1,2,3,4} + R_5} = \frac{5.72 * 6}{5.72 + 6} = \underline{\underline{2.93\Omega}}$$

$$R_{4,5} = R_4 + R_5 = 3 + 6 = 9\Omega$$

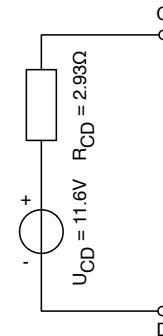
$$R_{3,4,5} = \frac{R_3 * R_{4,5}}{R_3 + R_{4,5}} = \frac{5 * 9}{5 + 9} = 3.214\Omega$$

$$R_{tot} = R_{1,2} + R_{3,4,5} = 6 + 3.214 = 9.214\Omega$$

$$I = \frac{E}{R_{tot}} = \frac{50}{9.214} = 5.426A$$

$$U_{R_{3,4,5}} = R_{3,4,5} * I = 3.214 * 5.426 = 17.44V$$

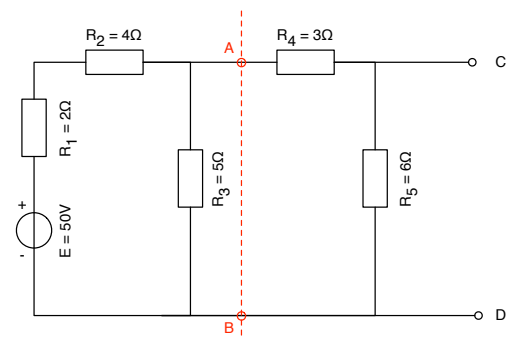
$$U_{CD} = U_{R_{3,4,5}} * \frac{R_5}{R_4 + R_5} = 17.44 * \frac{6}{3 + 6} = \underline{\underline{11.62V}}$$



2ème méthode:

$$R_{AB} = \frac{R_{1,2} * R_3}{R_{1,2} + R_3} = \frac{6 * 5}{6 + 5} = 2.72\Omega$$

$$U_{AB} = E * \frac{R_3}{R_1 + R_2 + R_3} = 50 * \frac{5}{2 + 4 + 5} = 22.72V$$

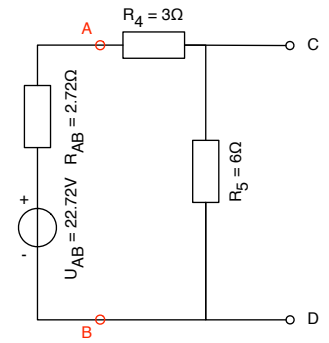


Le schéma initial se ramène au schéma suivant:

$$R_{AB,4} = R_{AB} + R_4 = 2.7\bar{2} + 3 = 5.7\bar{2}\Omega$$

$$R_{CD} = \frac{R_{AB,4} * R_5}{R_{AB,4} + R_5} = \frac{5.7\bar{2} * 6}{5.7\bar{2} + 6} = \underline{\underline{2.93\Omega}}$$

$$U_{CD} = U_{AB} * \frac{R_5}{R_{AB} + R_4 + R_5} = 22.7\bar{2} * \frac{6}{2.7\bar{2} + 3 + 6} = \underline{\underline{11.62V}}$$



3.

$$R_{AB} = \frac{R_1 * R_3}{R_1 + R_3} = \frac{14 * 1}{14 + 1} = 0.9\bar{3}\Omega$$

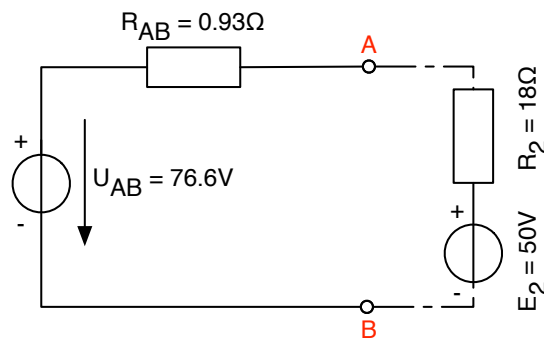
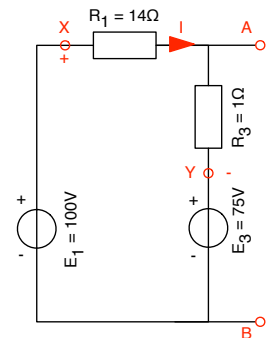
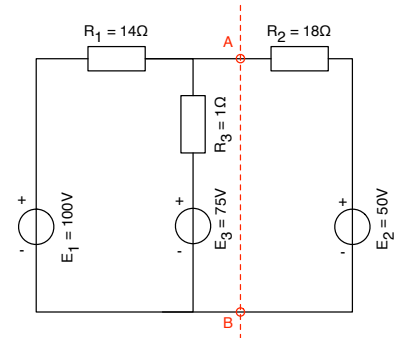
$$U_{XY} = E_1 - E_2 = 100 - 75 = 25V$$

$$I = \frac{U_{XY}}{R_1 + R_3} = \frac{25}{14 + 1} = 1.6\bar{A}$$

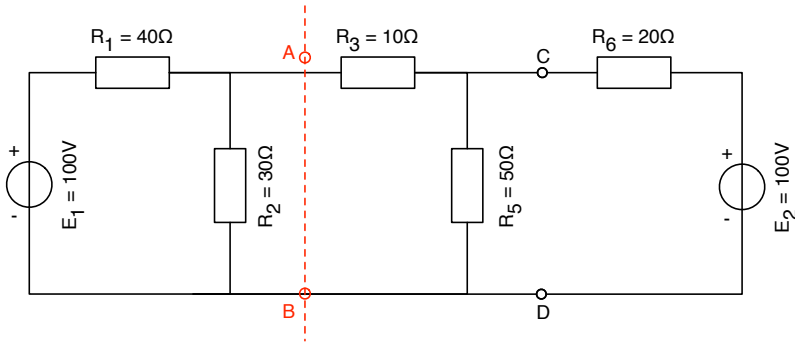
$$U_{R_3} = R_3 * I = 1 * 1.6\bar{A} = 1.6\bar{V}$$

$$U_{AB} = E_3 + U_{R_3} = 75 + 1.6\bar{V} = 76.6\bar{V}$$

$$I_{R_2} = \frac{U_{AB} - E_2}{R_{AB} + R_2} = \frac{76.6\bar{V} - 50}{0.9\bar{3} + 18} = \underline{\underline{1.4A}}$$

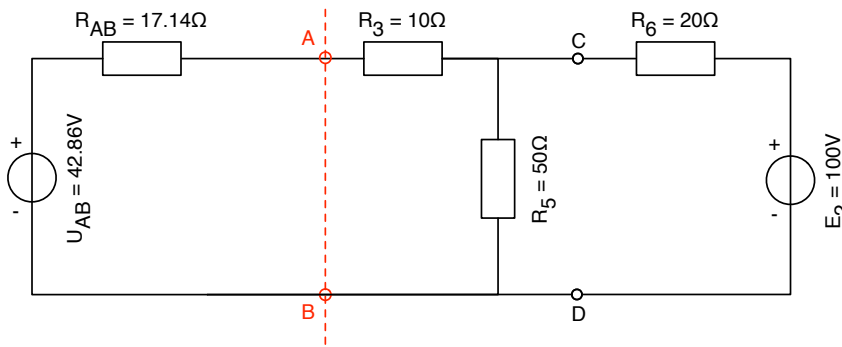


4.



$$R_{AB} = \frac{R_1 * R_2}{R_1 + R_2} = \frac{40 * 30}{40 + 30} = 17.14\Omega$$

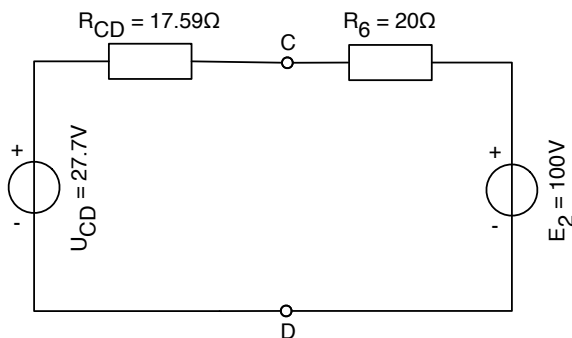
$$U_{AB} = E_1 * \frac{R_2}{R_1 + R_2} = 100 * \frac{30}{40 + 30} = 42.86V$$



$$R_{AB,3} = R_{AB} + R_3 = 17.14 + 10 = 27.14\Omega$$

$$R_{CD} = \frac{R_{AB,3} * R_5}{R_{AB,3} + R_5} = \frac{27.14 * 50}{27.14 + 50} = 17.59\Omega$$

$$U_{CD} = U_{AB} * \frac{R_5}{R_{AB} + R_3 + R_5} = 42.86 * \frac{50}{17.14 + 10 + 50} = 27.78V$$



$$U_{tot} = E_2 - U_{CD} = 100 - 27.78 = 72.22V$$

$$U_{R_6} = U_{tot} * \frac{R_6}{R_{CD} + R_6} = 72.22 * \frac{20}{17.59 + 20} = \underline{\underline{38.43V}}$$

