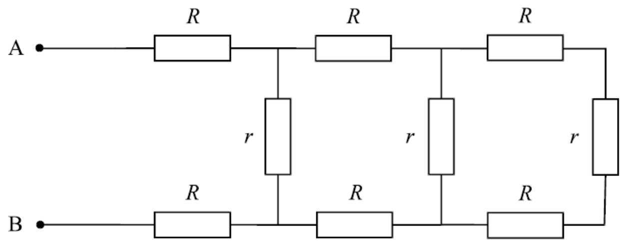
Mohamed Khider University of Biskra
Science and Technology Faculty
2nd year engineering

Fondamental Electricity

Tutorial N°1 (continuous regime)

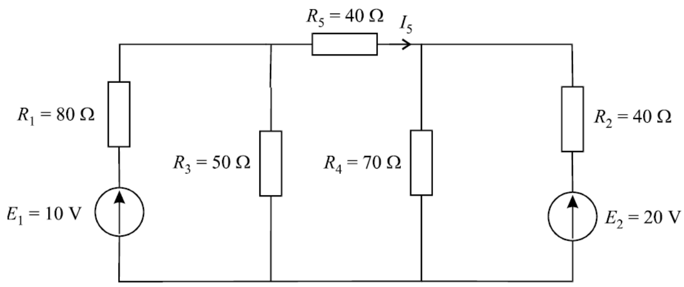
Exercise 1: Calculation of the equivalent resistance of a network of multiple resistors

- Determine the equivalent resistance Req of the dipole AB shown in the following figure.



Exercise 2: Calculation of a current in a three-mesh circuit powered by two generators

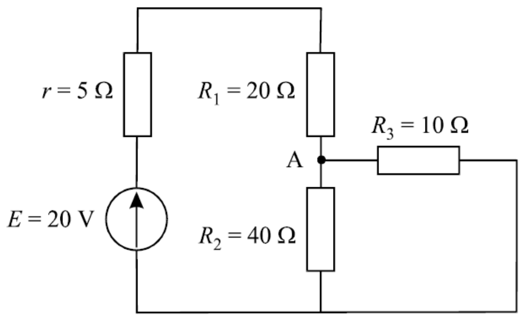
- Determine the current I_5 flowing through resistor R_5 in the circuit shown in the figure.



Exercise 3: Application of the voltage divider principle

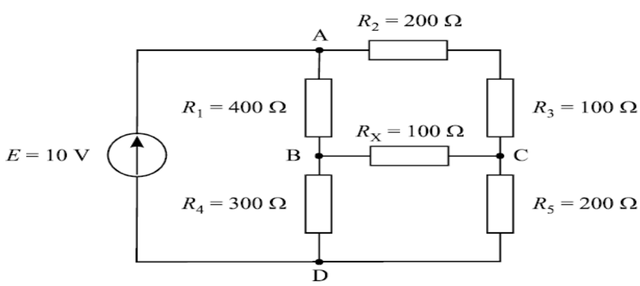
Consider the circuit shown in the following Figure

1. Determine the potential at point A without using Kirchhoff's laws.
2. Deduce the currents in the different branches of the circuit.
3. Then verify Kirchhoff's node law at point **A.**



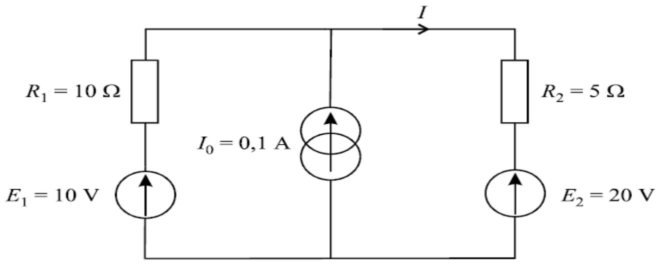
Exercise 4: Calculating a current using Millman's theorem

- In the circuit shown in the following figure, determine the value of the current flowing through resistor R_X.



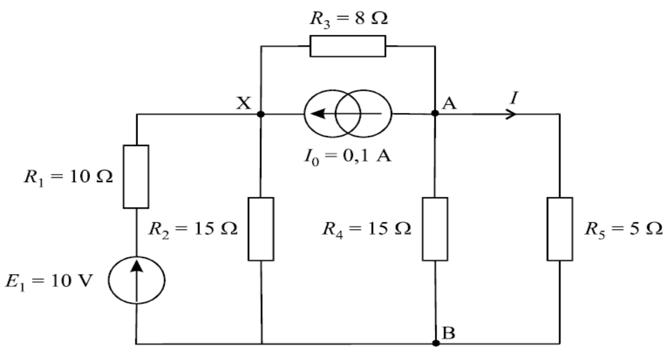
Exercise 5: Application of the superposition principle in a three-generator circuit

- Dans le montage représenté sur la figure, déterminer le courant I dans la résistance $R2$



Exercise 6: Calculation of a current using successive Thévenin Norton transformations

- Determine the current I in resistor R5 of the circuit shown in the figure.



Exercise 7 : Triangle star transformation

Consider the combination of three resistors R1, R2 and R3, shown in a triangle in Figure 1. Let IA, IB and IC be the currents entering points A, B and C respectively, and VA, VB and VC the voltages at these same points.

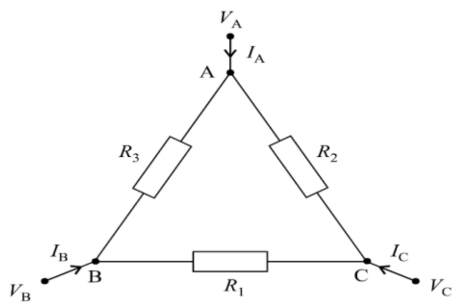


Figure1

We propose to demonstrate that there is a star connection equivalent to this delta connection, in other words, to show that there is a diagram such as the one shown in Figure 2, for which the currents I_A, I_B and I_C are unchanged, and this for the same values of the voltages at points A, B and C. We propose to determine the values of R_1, R_2 and R_3 as a function of R_A, R_B and R_C.

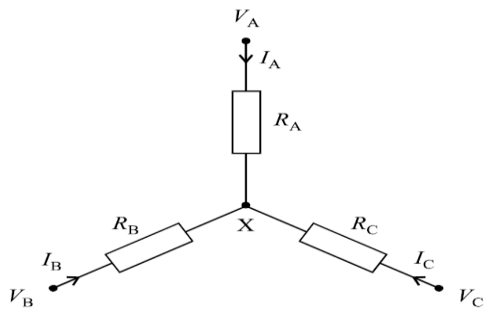


Figure2

a) In the circuit shown in Figure 2, apply Millman's theorem to point X and express V_X in terms of V_A, V_B, and V_C

b) Deduce the values of currents I_A, I_B, and I_C in terms of V_A, V_B, and V_C on the one hand, and R_A, R_B, and R_C on the other.

c) In the circuit shown in Figure 1, determine the currents I_A, I_B, and I_C as a function of V_A, V_B, and V_C on the one hand, and R_1, R_2 and R_3 on the other.

d) Deduce the values of R_1, R_2 and R_3 as a function of R_A, R_B, and R_C

e) Consider the circuit shown in Figure 3. Using the previous results and calculating the equivalent resistance of the entire network of resistors, determine the current I in the circuit.

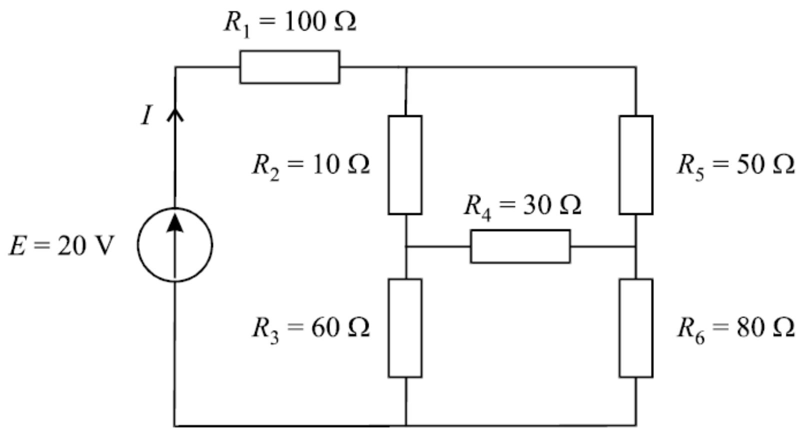


Figure 3

Exercise 8 : Power consumption in a circuit powered by two DC generators

In the circuit shown in the figure below, determine the average power consumed by each resistor, as well as the power delivered by each of the two generators. Verify the principle of power conservation in this circuit.