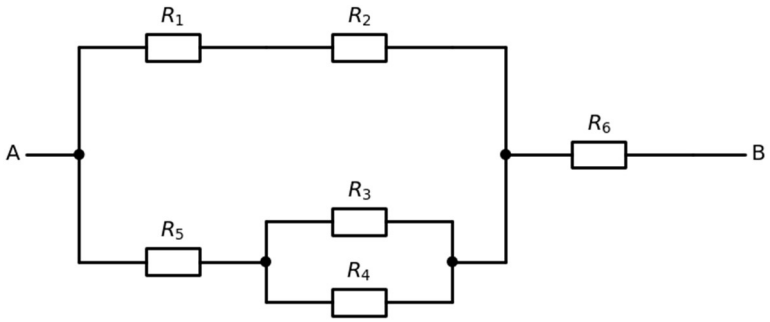
Tutorial Nº 2 : ELECTRIC CIRCUITS

Exercise 1

Consider the electrical circuit show below



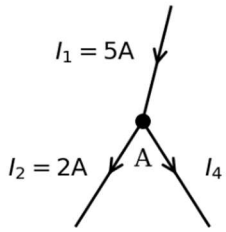
Calculate the equivalent resistance between pointes A and B.

Given: $R_1 = 7\ \Omega$, $R_2 = 5\ \Omega$, $R_3 = 3\ \Omega$, $R_4 = 6\ \Omega$, $R_5 = 4\ \Omega$, $R_6 = 5\ \Omega$

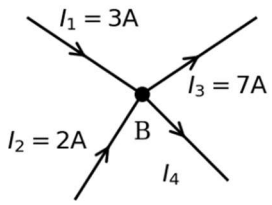
Exercise 2

1) Determine the current intensity I_4 in each of the following four cases by applying Kirchhoff's Current Law (KCL).

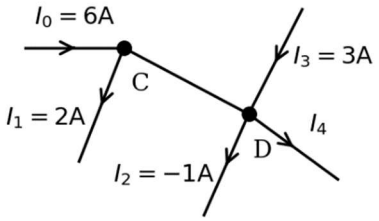
a)



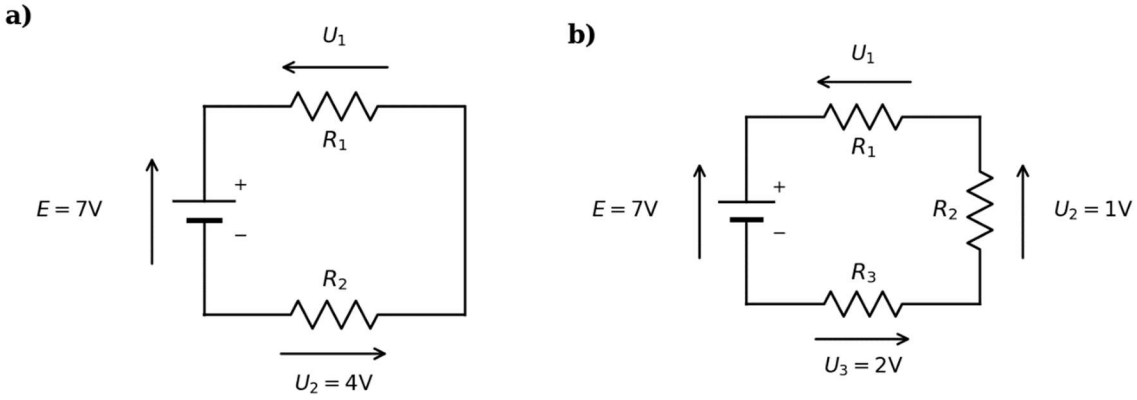
b)



c)

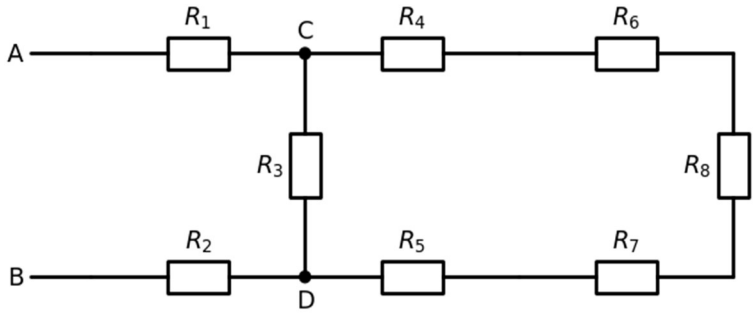


2) Determine the voltage U_1 across the resistor R_1 in each of the following two circuits by applying Kirchhoff's Voltage Law (KVL).



Exercise 3

Consider the electrical circuit shown in the figure blow.



1) Calculate the equivalent resistance R_{AB} between A and B of the circuit.
2) The pointes A and B are connected to a generator whose internal resistance is negligible

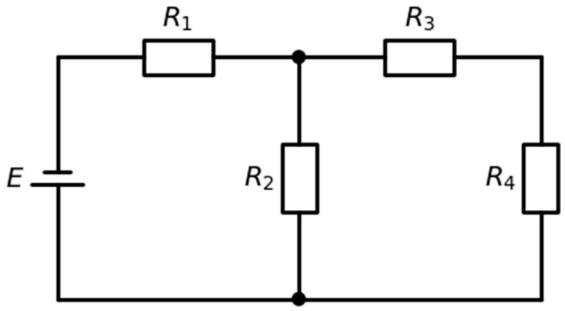
Calculate :

a. The total current supplied by the generator.
b. The voltage U_{AC} betweem points A and C.
c. The voltage U_{CD} across the resistor, then determine the current flowing through the corresponding branch CD.
d. The electrical power dissipated by Joule heating in the resistor R_3.

Given : $R_1 = 2\ \Omega,\ R_2 = 3\ \Omega, R_3 = 10\ \Omega, R_4 = R_5 = R_6 = R_7 = R_8 = 2\ \Omega, E = 20\ V$

Exercise 4

Consider the electrical circuit shown in the figure below.



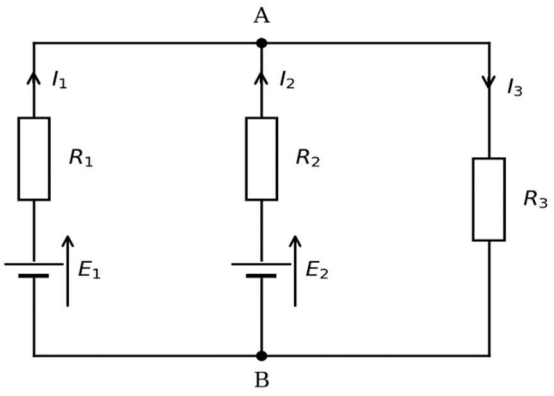
Determine the current flowing through the battery using the following two methods:

1) By calculating the equivalent resistance.
2) By applying Kirchhoff's laws.

Given : $E = 12\ V$, $R_1 = 20\ \Omega$, $R_2 = 20\ \Omega$, $R_3 = 30\ \Omega$, $R_4 = 8\ \Omega$.

Exercise 5

Consider the circuit shown above, consisting of three parallel branches.

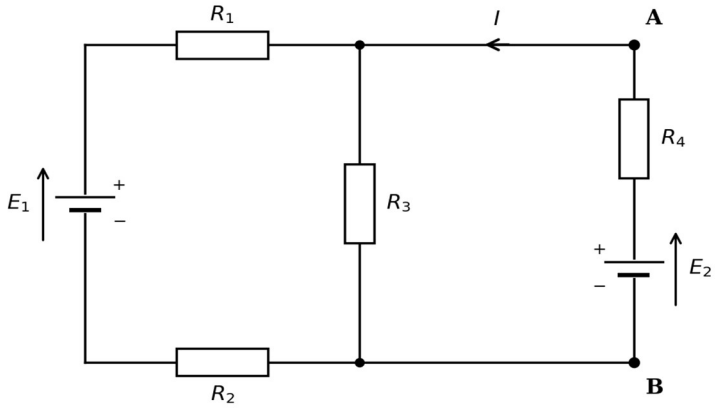


Détermine the current intensities I_1, I_2 and I_3 in the three branches.

Given : $R_1 = 2\ \Omega$, $R_2 = R_3 = 4\ \Omega$, $E_1 = 14$ V et $E_2 = 20$ V.

Exercise 6

Consider the electrical circuit show in the figure below.

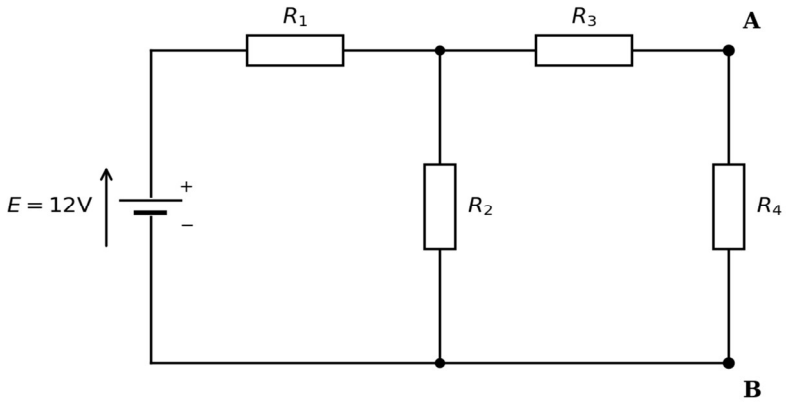


1) Determine the Thevenin voltage between points A and B.
2) Determine the Thevenin resistance between points A and B.
3) Draw the Thevenin equivalent circuit.
4) Calculate the current flowing through resistor R_4.

Given : $E_1 = E_2 = 5\ V$, $R_1 = 2\ k\Omega$, $R_2 = 6\ k\Omega$, $R_3 = 8\ k\Omega$, $R_4 = 1\ k\Omega$.

Exercise 7

Consider the electrical circuit shown below :



1) Determine the Norton resistance R_N between A and B.
2) Determine the Norton current I_N between points A and B.
3) Draw the Norton equivalent circuit.
4) Calculate the current I_4 flowing through the resistor R_4.

Given : $E = 12\ V$, $R_1 = 4\ \Omega$, $R_2 = 12\ \Omega$, $R_3 = 3\ \Omega$, $R_4 = 3\ \Omega$