Ministry of Higher Education and Scientific Research

University Mohamed Boudiaf of M'sila

Faculty of Mathematics and Computer Science

Department of Computer Science

General Electricity

Problems & Exercises (of Chap 3, 4)

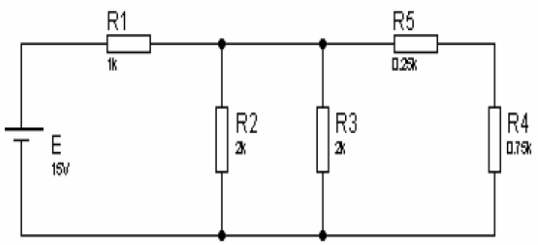
Electrokinetics, Magnetostatics

Z. Elbahi (2025/2026)

Exercise 1

Consider the following circuit:

Given: $\mathbf{R_1}$ = 1 kΩ, $\mathbf{R_2}$ = $\mathbf{R_3}$ = 2 kΩ, $\mathbf{R_4}$ = 0.75 kΩ, $\mathbf{R_5}$ = 0.25 kΩ, and a voltage source **E** = 15 V.

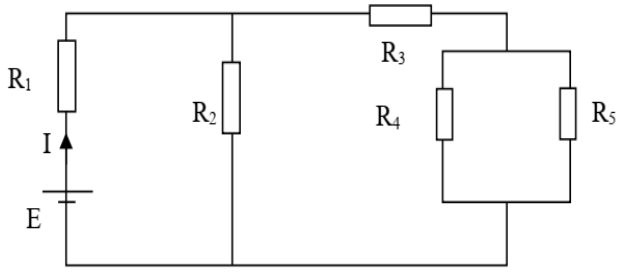


1. Calculate the total resistance $\mathbf{R_T}$ seen by the source **E**.
2. Determine the current **I** supplied by the source **E**.
3. Calculate the voltage $\mathbf{U_3}$ across resistor $\mathbf{R_3}$.
4. Calculate the voltage $\mathbf{U_4}$ across resistor $\mathbf{R_4}$.
5. Calculate the voltage $\mathbf{U_5}$ across resistor $\mathbf{R_5}$.
6. Determine the currents flowing in each branch.
7. Calculate the power dissipated by each resistor.
8. Compute the total power $\mathbf{P_T}$ dissipated by all the resistors, and the power **P** delivered by the source **E**. Conclude.

Exercise 2

Consider the circuit shown in the figure below:

Given **E** =12 V, $\mathbf{R_1}$ = 2 Ω, $\mathbf{R_2}$=20 Ω, $\mathbf{R_3}$=16 Ω, $\mathbf{R_4}$=6 Ω, $\mathbf{R_5}$=12 Ω.



1. Calculate the current ***I*** delivered by the source by applying Kirchhoff's two laws.
2. Re-obtain the value of the current ***I*** by computing the equivalent resistance of the circuit.
3. Determine the potential difference (voltage) across $\boldsymbol{R_2}$ and deduce the power dissipated by resistor $\boldsymbol{R_2}$.
4. Find the currents flowing through resistors $\boldsymbol{R_4}$ and $\boldsymbol{R_5}$.

Exercise 3

A charged particle with electric charge $\boldsymbol{q = 3.2\times10^{-19}\ C}$ moves in a uniform magnetic field of magnitude $\boldsymbol{B=1.5T}$, directed along the positive **z-axis**. For each of the cases below:

- Determine the magnetic force $\vec{\boldsymbol{F}}$ acting on the particle.
- Sketch a diagram showing the directions of the velocity vector $\vec{\boldsymbol{v}}$, the magnetic field $\vec{\boldsymbol{B}}$, and the magnetic force $\vec{\boldsymbol{F}}$.

(a) The particle moves along the positive ***x*-axis** with a speed of $\mathbf{4{,}0.10^4\ m\backslash\ s}$.

(b) The particle moves along the negative **y-axis** with a speed of $\mathbf{5{,}5.10^4\ m\backslash\ s}$.

(c) The particle moves along the positive **y-axis** with a speed of $\mathbf{6{,}0.10^4\ m\backslash\ s}$.

(d) The particle moves along the positive **z-axis** with a speed of $\mathbf{3{,}5\times10^4\ m\backslash\ s}$.

(e) The particle is at rest.