Module: Electricity

Tutorial Worksheet No. 1

Duration: 1 week

Objective:

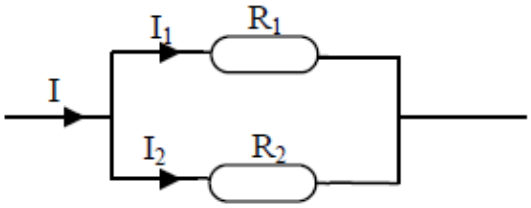
- Determination of voltages and currents in electrical circuits using equivalences between generators, voltage and current dividers, and Kirchhoff's laws

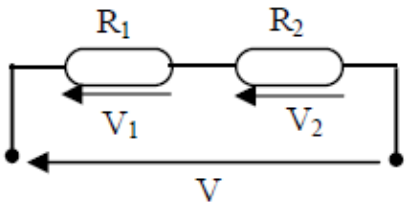
Exercises to do in class: Exercises 1, 2, 3 and circuit A from exercise 4

Assignment to submit: Circuits **C** and **D** from exercise 4

Exercise 1

1. Determine the expressions for I_1 and I_2 as a function of I. Can the result be generalized to several parallel branches?
2. Determine the expressions for V_1 and V_2 as a function of V. Can the result be generalized to several branches in series?

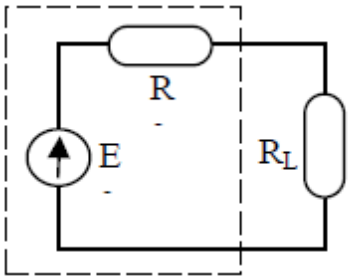


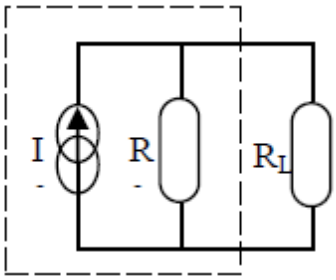


Exercise 2

Consider two real generators (E, R) and (I, R) each supplying the same load R_L.

- Show that, if $E = R \cdot I$, the power dissipated in R_L is the same in both cases.
- What conclusion can be drawn?



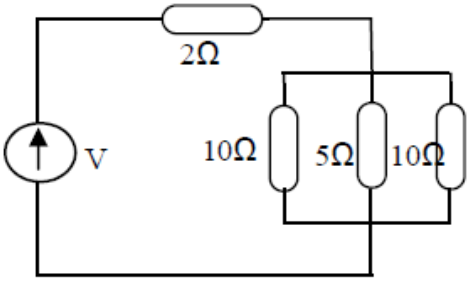


Exercise 3

Determine the voltage V causing a current of 14A in the 5Ω resistor.

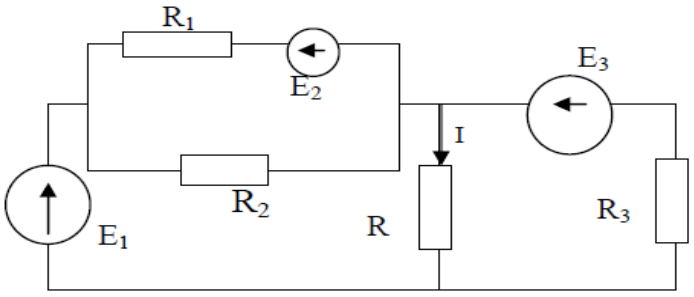
a) Using the result from exercise 1.

b) Using the result from exercise 2.

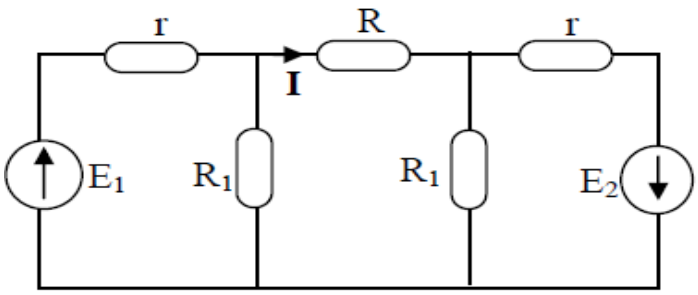


Exercise 4

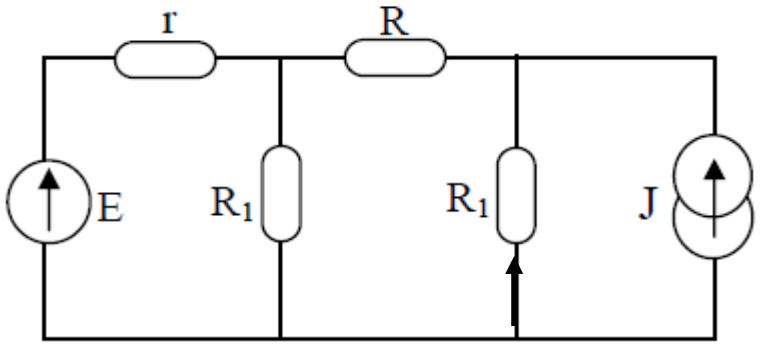
1. Using the results from exercises 1 and 2, calculate the current I in each of the following circuits.
2. Using Kirchhoff's laws (KVL and KCL), calculate the current I in each of these circuits.



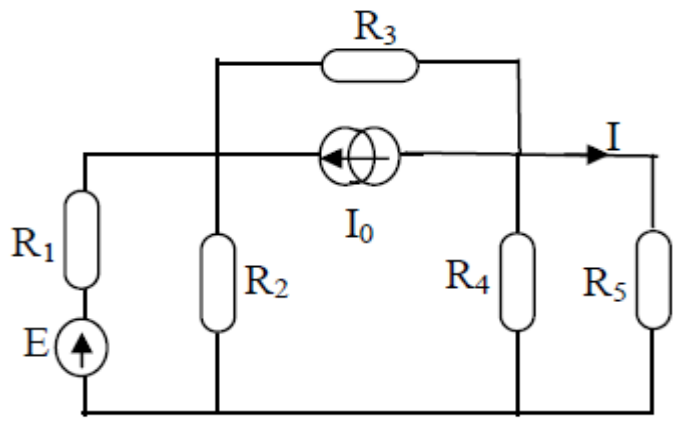
$E_1 = E_2 = 10$ V
$E_3 = 5$ V
$R_1 = R_3 = 10$ kΩ
$R = R_2 = 5$ kΩ



E_1=1V,
E_2=2V,
r =500Ω,
R=1kΩ,
R_1=1,5KΩ;



E= 1V,
J=2mA,
r =500 Ω,
R=1k Ω,
R_1=1,5K Ω



E=10V,
I_0= 0,1 A,
R_1= 10 Ω,
R_2 = 15 Ω,
R_3 = 8 Ω,
R_4 = 14 Ω,
R_5= 5 Ω.