MARMARA UNIVERSITY
FACULTY OF ENGINEERING

PHYS 1104

PHYSICS LABORATORY II

Serial and Parallel Resistors Circuits

Section:
Group:
Instructure: Date:

	Department	Student Id Number	Name & Surname
1			
2			
3			

1 Purpose

To learn serial and parallel combination of resistors in electric circuits.

2 Theory

2.1 Series Combination of Resistors

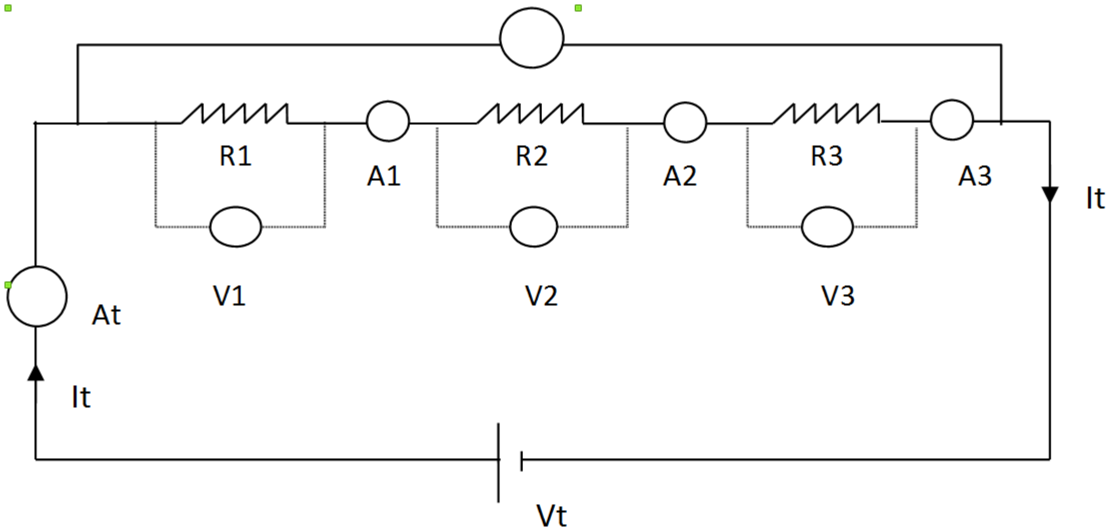

Figure 1: Three resistors connected in series form

The resistors are said to be connected in series if the sum of the potential differences across each is equal to potential difference, Vt of supply

The currents passes through the each resistor are equal with It in the circuit

$$I_t = I_1 = I_2 = I_3 \tag{1}$$

$$I_t = \frac{V_t}{R_1 + R_2 + R_3} \tag{2}$$

for the equivalent resistance

$$R_{eq} = R_1 + R_2 + R_3 \tag{3}$$

the extension to n resistors is straightforward

$$R_{eq} = \Sigma R_n \tag{4}$$

The potential difference Vt is equal to the sum of the potential differences of each resistor

$$V_t = V_1 + V_2 + V_3 \tag{5}$$

equation(2) can be rewritten by the substitution of equation (3)

$$I_t = \frac{V_t}{R_{eq}} \tag{6}$$

2.2 Resistors in Parallel Combination

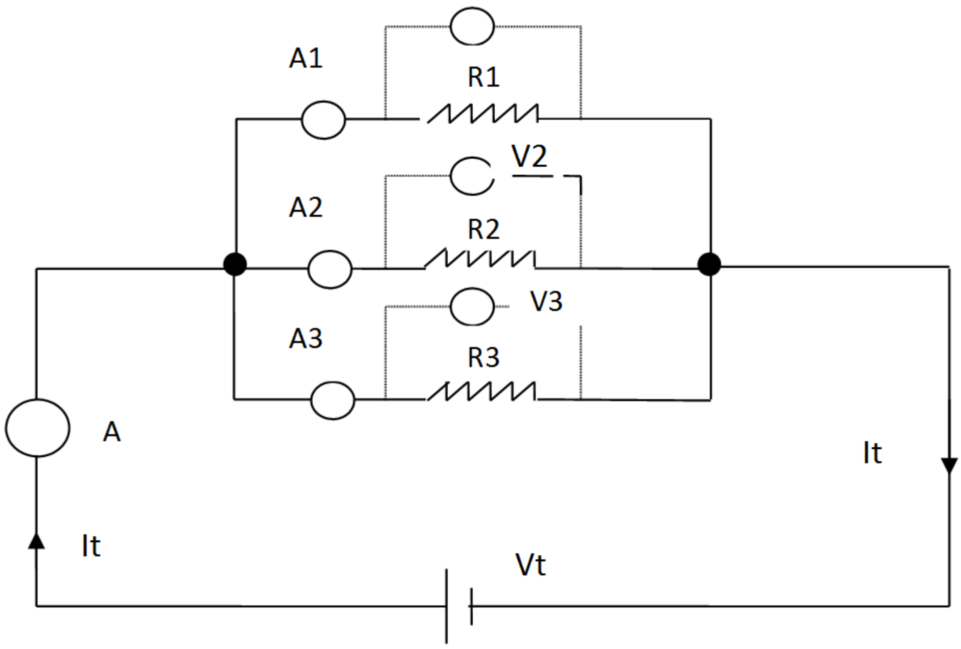

Figure 2: Three resistors connected in parallel form

The currents in the three branches of Fig. 2 are

$$I_1 = \frac{V_1}{R_1} \tag{7}$$

$$I_2 = \frac{V_2}{R_2} \tag{8}$$

$$I_3 = \frac{V_3}{R_3} \tag{9}$$

The potential difference on each branch are equal to each other

$$V_t = V_1 = V_2 = V_3 \tag{10}$$

Total current I_t on the main branch is equal to the sum of the currents on each branch

$$I_t = I_1 + I_2 + I_3 \tag{11}$$

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \tag{12}$$

The equivalent resistance, R_eq

Extending this result to the case of n resistors, we find

$$\frac{1}{R_{eq}} = \Sigma \frac{1}{R_n} \tag{13}$$

2.3 Series and parallel Combination of Resistors

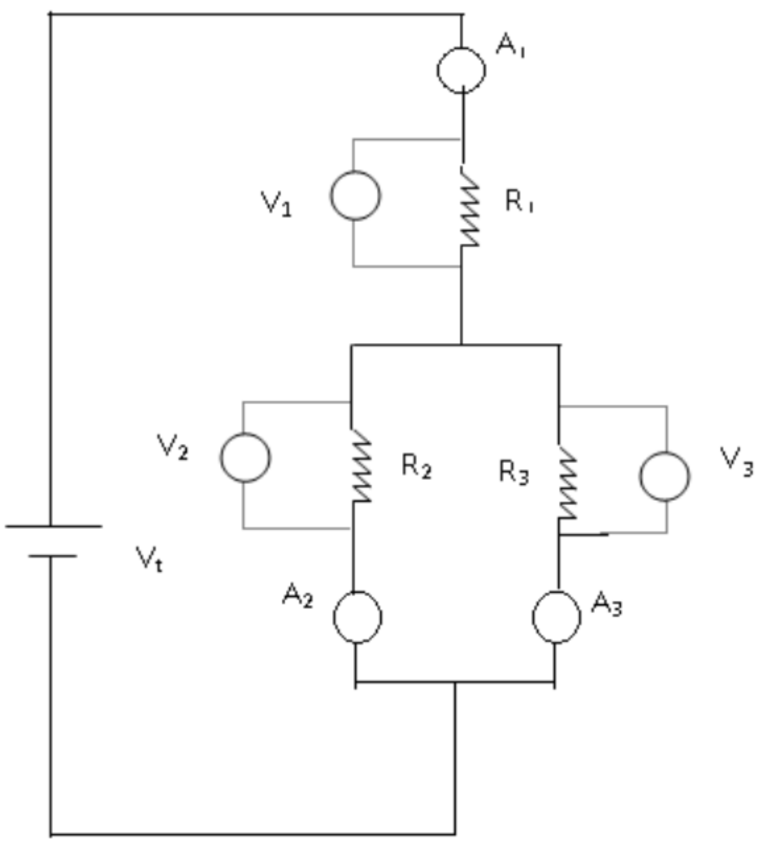

Figure 3: Combination of serial and parallel resistors

3 Experimental Setup

3.1 Equipment List

1. Board x1
2. Dc voltage source x1
3. Digital multimeter x2
4. Connection cables 40cm x3
5. Connection cables 25cm x4
6. Connection cables 15cm x5
7. Resistors x3

4 Procedure

1. Calculate resistance's value that you will use via the table and measure them with multimeter.
2. Connect resistance as schemes above. Measure and record equivalent resistance by multimeter before apply voltage to circuit.
3. Apply 'supply voltage' to all of circuit.(Max. 5V)
4. Build four connection scheme that given below on board and measure voltage value on each resistance. Calculate passing current and fill the table.
5. Calculate equivalent resistance for each scheme and compare initial equivalent resistance value with the value you get. Then calculate your percentage error.
6. Compare current passing all branches of circuits and voltage on all branches of circuits with total current passing in circuits and applied voltage on whole circuit. If there is a difference, specify reasons of this difference.
7. Build serial and parallel circuits randomly and then measure their equivalent resistance. Later, compare these values with your theorical values.
8. Interpret your conclusions

Table 1: Theoretical voltage, current and resistor values.

Figure(1)	V_1 :	V_2 :	V_3 :
	R_1 :	R_3 :	R_3 :
	I_1 :	I_2 :	I_3 :
Equivalent resistance 1:			
Figure(2)	V_1 :	V_2 :	V_3 :
	R_1 :	R_3 :	R_3 :
	I_1 :	I_2 :	I_3 :
Equivalent resistance 2:			
Figure(3)	V_1 :	V_2 :	V_3 :
	R_1 :	R_3 :	R_3 :
	I_1 :	I_2 :	I_3 :
Equivalent resistance 3:			

Table 2: Measured voltage, current and resistor values.

Figure(1)	V_1 :	V_2 :	V_3 :
	R_1 :	R_3 :	R_3 :
	I_1 :	I_2 :	I_3 :
Equivalent resistance 1:			
Figure(2)	V_1 :	V_2 :	V_3 :
	R_1 :	R_3 :	R_3 :
	I_1 :	I_2 :	I_3 :
Equivalent resistance 2:			
Figure(3)	V_1 :	V_2 :	V_3 :
	R_1 :	R_3 :	R_3 :
	I_1 :	I_2 :	I_3 :
Equivalent resistance 3:			