ملاحظة مهمة جداً جداً جداً جداً جداً : هذا الريبورت وغيره ليس للنقل الحرفي .. هو مجرد وسيلة للمساعدة وأخذ الأفكار حول الطريقة الصحيحة لكتابة ريبورت (غير هيك مبروك عليكم علامة الصفر .. اللهم بلغت اللهم فاشهد)

Done by sandy ghassan &haneen al assaf

<<Experiment 2>>

The Objectives:

The objective of this experiment is to analyze simple resistive circuits in DC. The circuits

considered here are: resistors in series, resistors in parallel, series- parallel combination,

voltage divider, current divider, and delta combination. This experiment will allow the

experimental verification of the theoretical analysis.

Theory :

1. **ohm's law:**

The voltage V (in volt,v) across resistor is directly proportional to the current I (in amperes, A)flowing through it & the constant of proportionality is R(in ohm,Ω).

V=RI

2. resisters in series:

- A current through N elements in series is same for all of them.

Is=I1=I2=I3=..........=In

- voltage across Ith element can determine by (Ri*Ii) ,(where i=number of element),& sum of voltage across each element equal to the voltage entire series combination.

Vs=V1+V2+V3+.......+Vn=$\sum$V

- the equivalent resistance of the series combination is the sum of individual resistances.

Req =R1+R2+R3+.......+Rn=$\sum$R

3. resistors in parallel:

- the voltage across N element same of all of them.

Vs=V1=V2=......=Vn

- the current through Ith element can be calculated by V/R (ohm law)

the total sum of current through each element equal to the current provided to the entire parallel combination.

Is=I1+I2+I3+......+In=$\sum$Ii

- the reciprocal of the equivalent resistance is the sum of reciprocal of individual resistances.

1/Req=1/R1+1/R2+1/R3+........+1/Rn

4. series – parallel combination:

To analysis this type of circuit you should substituting the series or parallel combinations by either equivalent resistances , such that the circuit is transformed into a pure parallel or series circuit & then you can find the electrical parameter (current & voltage) for this equivalent

resistances, also you can determine the current & voltage for the individual resistors by some method such that the relation between current & voltage which discuss previously & below.

5- Voltage divider :

A series circuit with two resistors will divide the applied voltage Vs into two voltages V 1and V 2 across each resistor , but we should note that V 2 is the output of the voltage divider & can calculate as this equation   V2=R2*Vs/(R1+R2)

6- Current divider :

The parallel circuit with two resistors will divide the applied current Is into two currents I1 and I2 through each resistor , but we should note that I2 is the output of the current divider & can calculate as this equation:

I2=R1*Is/(R1+R2)

7- Delta combination circuit :

   To analysis of this type of circuit you can use either mesh analysis or Δ to Y transformation formulas as you see below. This technique will simplify the circuit to a simple series- parallel combination circuit that can be solved easily.

*From Δ to Y:

R1=Rb*Rc/(Ra+RB+RC)

R2=Ra*Rb/(Ra+RB+RC)

R3=Ra*Rc/(Ra+RB+RC)

*From Y to Δ:

Ra= (R1*R2+R1*R3+R2*R3)/R1

Rb= (R1*R2+R1*R3+R2*R3)/R3

Rc= (R1*R2+R1*R3+R2*R3)/R2

Equipment :

- Power Supply (PS)
- Digital Multimeter (DMM)
- Breadboard
- Resistors

Procedure :

1] series – parallel combination:

- we will take 4 different resistor and read their value using color code
- fixed them in the breadboard.
- read the values of each resistor by using DMM (like experiment 1 then record the values in the table below.
- Switch on DC power supply of 10 V .
- Build the circuit in the breadboard as shown in the figure below:
- disconnect the P.S and measure the value of the equivalent resistance of the circuit Ra-c.
- measure the value of the voltage across ab and then bc (connect the DMM as a voltmeter in parallel with the resistors you want to measure)
- then measure I1,I2,I3,I4,Is (connect the DMM as an ammeter in series with the resistor you want to mesure)
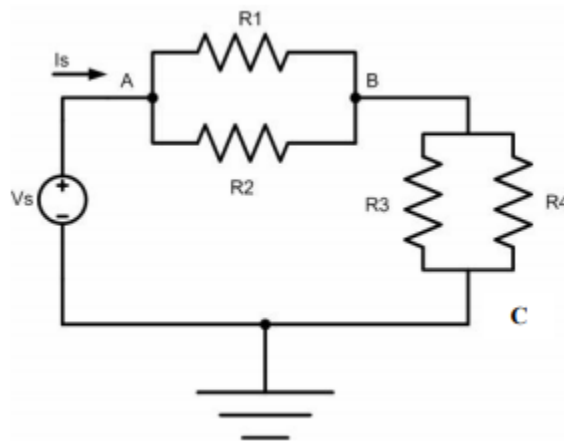
There are some calculations we have done in this experiment

1] Assemble the circuit in last figure with the component values shown in table .Use Vs=10V.
Take measurements to complete the entries corresponding to the experimental values.

parameter	unit	Theor	Exper	%Error	parameter	unit	Theor	Exper	%Error
R1		2	1.99	0.5%	I1		1.48	1.48	0
R2		2.7	2.63	2.59%	I2		1.096	1.11	1.2%
R3	KΩ	3.9	3.85	1.28%	I3	mA	1.804	1.82	0.88%
R4		9.1	8.92	1.97%	I4		0.773	0.77	0.38%
Ra-c		3.879	3.86	0.49%	Is		2.578	2.599	0.8%
Vab	v	2.962	2.96	0.06%	Vbc	V	7.037	7.04	0.042%

-Let us calculate the equivalent resistor

R12 = (2*2.7)/4.7 = 1.149 KΩ

** R34 = (3.9*9.1)/13 = 2.73 KΩ**

** Ra-c =1.149 +2.73 =3.879 KΩ**

Now ,

Is =Vs/Ra-c = 10/3.879 mA

Vab =Is *R12 =2.578*1.49 =2.962 V

Vbc =Is *R34 =2.578*2.73 = 7.037 V

I1 =Vab /R1 = 2.962/ 2 =1.48 Ma

I2 =Vab /R2 = 2.962/ 2.7 =1.48 mA

I3 =Vbc /R3 = 7.037 / 3.9 =1.48 mA

I4 =Vbc /R4 = 7.037 / 9.1 =1.48 mA

_____

2] Voltage and Current divider

- we will take 3 resistor and read their value using color code
- fixed them in the breadboard.

- Measure the values of each resistor by using DMM (like experiment 1 then record the values in the table below.
- Switch on DC power supply of 10 V
- Build the circuit in the breadboard as shown in the figure below:
- Measure the value of Vo (voltage a cross R2 or R3)
- Measure the values of I1,I2,Is using the same way in previous part
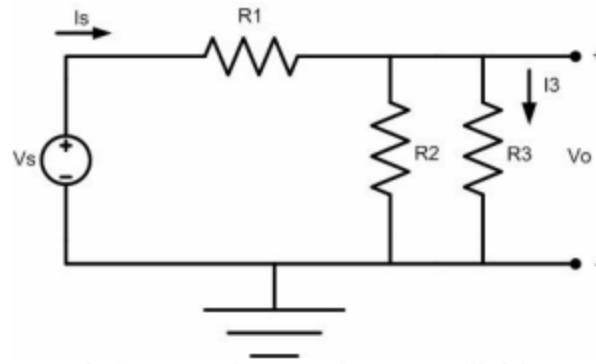
There are some calculations we have done in this experiment

Assemble the circuit in Fig with the component values shown in table Take measurements to complete the entries corresponding to the experimental values.

parameter	R1	R2	R3	Vs	Vo	Is	I1	I2	Req
Units	KΩ			V			mA		KΩ
theoretical	2	2.7	3.9	10	4.48	2.78	2.78	1.68	3.59
experimental	1.99	2.6	3.85	10	4.42	2.71	2.71	1.64	3.75
Error%	0.5%	2.59%	1.28%	0	1.3%	2.5 %	2.5%	2.3%	4.4%

**R23 = 2.7*3.9 /(2.7+3.9)= 1.595 KΩ

** Vo =Vs *R23 /(R+ R23) =10 *1.595 /3.595 =4.48 V

Is = I1 =Vs /(R1+R23) =10/3.595= 2.78 mA

I2 =Is *R3 /(R2+R3) =2.78*3.85/6.45 =1.64 mA

_____

Conclusion :

1] we learn how to connect the DMM as a VOLTMETER or an AMETER with the circuit

2] we notice that all of current or voltage divider law is come from ohm's and Kirchhoff laws

3] the current divider using in parallel circuit because current is branching out but the voltage divider using in series circuit because voltage is branching out

The Hashemite University

Faculty of Engineering

Department of Electrical Engineering

Electrical Circuit Lab

Experiment "2" (Measurements on DC Circuits)

Instructor's name : Dr. Mahmoud al smadi

Eng. name : Mohammad hattab

Student's names:

Sandy ghassan :

Haneen al assaf :

Date : 11/2/2020

Day : Tuesday