ASSIGNMENT NO: 1 DATE:	TIME: 80 MINUIT
ASSIGNMENT NAME: Identification of electrical measuring instruments, use, connection procedure & measuring with VM, AM, ΩM, Multi meter, Galvanometer, WM, Energy meter, Pf meter, Frequency meter, Temperature meter.	

Theory: Electrical measurements are the methods, devices and calculations used to measure electrical quantities. Measurement of electrical quantities may be done to measure electrical parameters of a system i.e. Electric current, Electrical resistance and electrical conductance etc.

The instruments used to measure any quantity are known as measuring instruments. If the instruments can measure the basic electrical quantities, such as voltage and current are known as basic measuring instruments.

Required instruments (at least) : VM, AM, ΩM, Multi meter, Galvanometer, WM, Energy meter, Pf meter, Frequency meter, Temperature meter.

List and Purpose of electrical and electronic measuring equipment

From Wikipedia, the free encyclopedia

Sl No	Name	Purpose
1	Ammeter (Ampermeter)	Measures current
2	Clamp meter	For measuring Ac current , frequency
3	Voltmeter	Measures the potential difference between two points in a circuit. (Includes: DVM and VTVM)
4	Ohmmeter	Measures the resistance of a component
5	Multimeter	General purpose instrument measures voltage, current and resistance (and sometimes other quantities as well)
6	Wattmeter	Measures the power
7	Cos Phi Meter	Measures the power factor
8	Microwave power meter	Measures power at microwave frequencies
9	Electricity meter or Energy meter	Measures the amount of energy dissipated
10	Capacitance meter	Measures the capacitance of a component
11	Frequency counter	Measures the frequency of the current
12	Q meter	Measures Q factor of the RF circuits
13	ESR meter	Measures the equivalent series resistance of capacitors
14	LCR meter	Measures the inductance, capacitance and resistance of a component
15	Leakage tester	Measures leakage across the plates of a capacitor
16	Oscilloscope	Displays waveform of a signal, allows measurement of frequency, timing, peak excursion, offset etc.

17	Signal generator	Generates signals for testing purposes
18	Psophometer	Measures AF signal level and noise
19	VU meter	Measures the level of AF signals in Volume units
20	Signal analyzer	Measures both the amplitude and the modulation of a RF signal
21	Distortion meter	Measures the distortion added to a circuit
22	Spectrum analyzer	Displays frequency spectrum
23	Sweep generator	Creates constant-amplitude variable frequency sine waves to test frequency response
24	Video signal generator	Generates video signal for testing purposes
25	Vector scope	Displays the phase of the colors in color TV
26	Transistor tester	Tests transistors
27	Tube tester	Tests vacuum tubes (triode, tetrode etc.)
28	Tachometer	Measures speed of motors

Connection Diagram:

Questions:

1. Why does Multimeter is so named.
2. How do we confirm the direction of current in a DC Ammeter through the probe ?
3. What is the main difference between Oscilloscope and Signal generator ?
4. How does Ohmmeter measures the value of resistance without external voltage source as how an ammeter or voltmeter measures ?

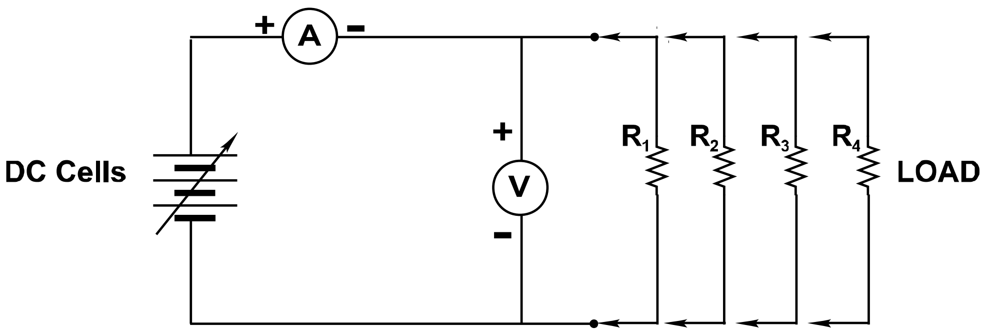
Multi Meter-2

X1 X10 X100 X1K

ASSIGNMENT NO: 2
ASSIGNMENT NAME: Verification of Ohm's law

Theory: The ratio of potential difference(V) between two points on a conductor to the current(I) flowing between them, is constant, provided the temperature of the conductor does not change. In other words, $^{V}/_{I}$= constant or $^{V}/_{I}$=R, where R is the resistance of the conductor between the two points considered.

Circuit diagram:



Required instruments & materials:

1. Trainer set............................. 1 no.
2. Digital multimeter...................2 nos.
3. Dry cell, size D-D, 1.5V........3 nos.
4. Battery case for 3 cells...........1 no.
5. Jumper with crocodile clip.....According to necessary

Data:

Obs. No.	**For R_1 (Ω)**		**For R_2 (Ω)**		**For R_3 (Ω)**		**For R_4 (Ω)**		**Remark**
	Voltage	Current	Voltage	Current	Voltage	Current	Voltage	Current	
1									
2									
3									

Remarks:

Worksheet:

1. When the current of a 470 Ω resistance measured then the output voltage of three dry cells is 4.83 volts and when the current of a 47 Ω resistance measured then the output voltage of three dry cells is 4.45 volts at closed circuit condition. Explain the reason.

2. Measure the internal resistance of the cell.

ASSIGNMENT NO: 3
ASSIGNMENT NAME: Study the characteristics of series ckt.

Theory: When more than one resistor are joined end-to-end, makes only one path and flows same current in all resistors is called series ckt.

In this ckt

$V_T = V_1 + V_2 + V_3 + \dots\dots\dots\dots V_N$

$I_T = I_1 = I_2 = I_3 = \dots\dots\dots\dots\dots I_1$

$R_T = R_T + R_2 + R_3 + \dots\dots\dots\dots R_N$

$P_T = P_1 + P_2 + P_3 + \dots\dots\dots\dots P_N$

Circuit diagram:

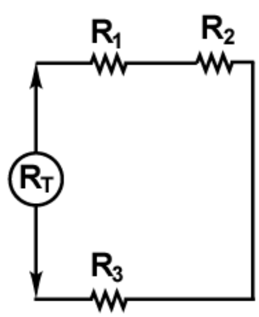


fig - a

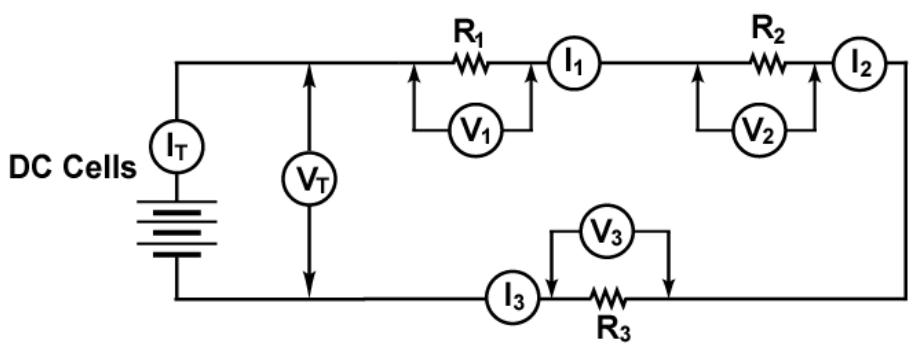


fig - b

Required instruments & materials:
1. Trainer set............................. 1 no.
2. Digital multimeter..................1 no.
3. Dry cell, size D-D, 1.5V.........3 nos.
4. Battery case for 3 cells...........1 no.
5. Jumper with crocodile clip.....According to necessary

Data:

OBS NO	V_T	V_1	V_2	V_3	V_{CAL}= $V_1+V_2+V_3$	% Error= $(\frac{V_T - V_{CAL}}{V_T})\times 100$	Remarks
1							
2							

OBS NO	R_T	R_1	R_2	R_3	R_{CAL}= $R_1+R_2+R_3$	% Error= $(\frac{R_T - R_{CAL}}{R_T})\times 100$	Remarks
1							
2.							

OBS NO	I_T	I_1	I_2	I_3	Remarks
1					
2					

Remarks:

Worksheet: In a series circuit 47, 100, 150, 470 ohms resistor are connected in series condition, Write the equation of voltage divider rule & determine the voltage drop of 150 ohm resistor if the source voltage is 4.62V.

ASSIGNMENT NO: 4
ASSIGNMENT NAME: Study the characteristics of parallel ckt.

Theory: When more than one resistor is connected in such a way that the first terminal of every resistor are connected in a common point and the second terminal of all the resistors are connected in another common point having individual path is called parallel ckt.

Here-

$V_T = V_1 = V_2 = V_3 = \ldots\ldots\ldots\ldots V_N$

$I_T = I_1 + I_2 + I_3 + \ldots\ldots\ldots\ldots I_N$

$1/R_T = 1/R_1 + 1/R_2 + 1/R_3 + \ldots\ldots 1/R_N$

$P_T = P_1 + P_1 + P_2 + P_3 + \ldots\ldots P_N$

Circuit Diagram:

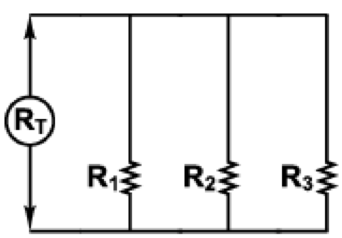


fig-a

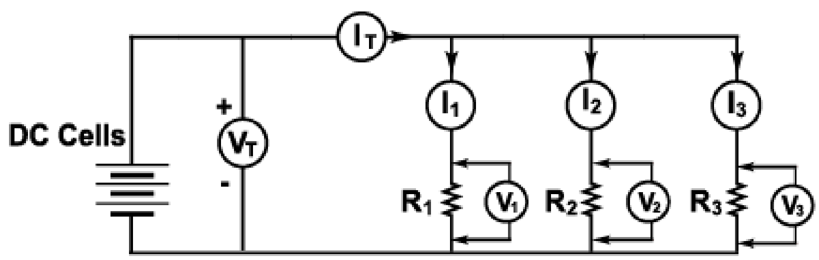


fig-b

Required instruments & materials:

1. Trainer set............................. 1 no.
2. Digital multimeter...................1 no.
3. Dry cell, size D-D, 1.5V.........4 nos.
4. Battery case for 3 cells............1 no.
5. Jumper with crocodile clip.....According to necessary

Data:

OBS NO.	I_T	I_1	I_2	I_3	$I_{CAL}=$ $I_1+I_2+I_3$	% Error = $(\frac{I_T - I_{CAL}}{I_T})\times 100$	Remarks
1							
2							

OBS NO.	R_T	R_1	R_2	R_3	$R_{CAL}= \dfrac{1}{\frac{1}{R1}+\frac{1}{R2}+\frac{1}{R3}}$	% Error= $\left(\dfrac{R_T - R_{CAL}}{R_T}\right)\times 100$	Remarks
1							
2							

OBS NO.	V_T	V_1	V_2	V_3	Remarks
1					
2					

Remarks:

Worksheet:

ASSIGNMENT NO: 5
ASSIGNMENT NAME: Verification of Kirchhoff's Voltage Law(KVL)

Theory: Kirchhoff's Voltage Law states that the algebraic sum of the potential rises and drops around a closed loop(or path) is zero. Which may be interpreted as

sum of voltage drop = sum of voltage rises.

Circuit Diagram:

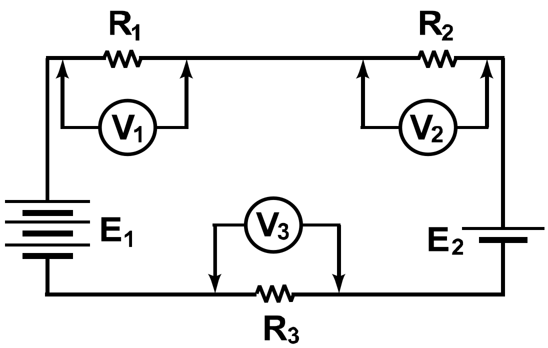


fig - b KIRCHHOFF'S VOLTAGE LAW

Required instruments & materials:

1. Trainer set.............................. 1 no.
2. Digital multimeter...................1 no.
3. Dry cell, size D-D, 1.5V.........4 nos.
4. Battery case for 3 cells............1 no.
5. Battery case for 1 cell..............1 no.
6. Jumper with crocodile clip.....According to necessary

Data:

OBS NO.	E_1 (volt)	E_2 (volt)	$\sum E$	IR_1 (volt)	IR_2 (volt)	IR_3 (volt)	$\sum IR$ (Volt)	% Error $\frac{\sum E - \sum IR}{\sum E} \times 100$	Remark
1									**KVL**
2									

Remarks:

Worksheet:

ASSIGNMENT NO: 6
ASSIGNMENT NAME: Verification of Kirchhoff's Current Law(KCL)

Theory: Kirchhoff's Current Law (KCL) states that, the algebraic sum of the currents entering and leaving a node is zero.(A node is a junction of two or more branches). In otherwords, the sum of the currents entering a node must equal the sum of the currents leaving a node. In equation form, $I_{\text{Entering}} = I_{\text{Leaving}}$

Circuit Diagram:

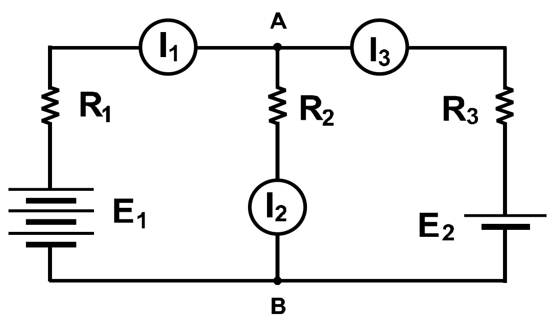


fig - a KIRCHHOFF'S CURRENT LAW

Required instruments & materials:

1. Trainer set.............................. 1 no.
2. Digital multimeter...................1 no.
3. Dry cell, size D-D, 1.5V.........4 nos.
4. Battery case for 3 cells............1 no.
5. Battery case for 1 cell.............1 no.
6. Jumper with crocodile clip.....According to necessary

Data:

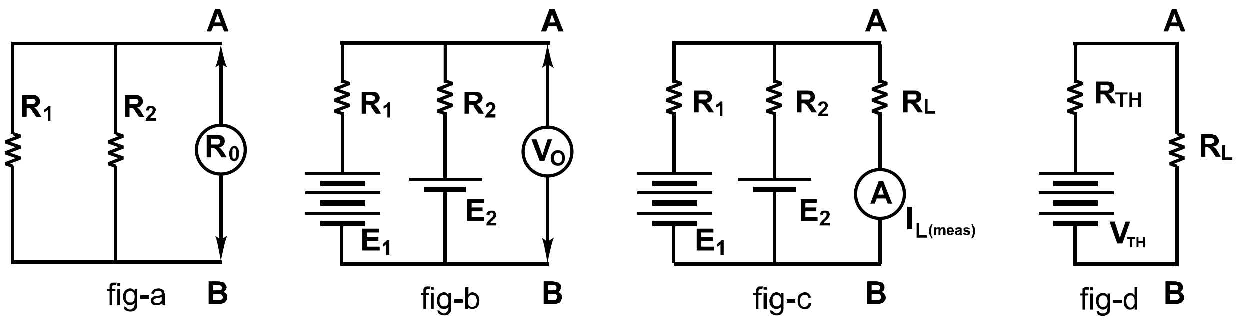
OBS NO	I_1 (mA)	I_2 (mA)	I_3 (mA)	$\sum I_{in}$ (mA)	$\sum I_{out}$ (mA)	% Error $\frac{\sum I_{in} - \sum I_{out}}{\sum I_{in}} \times 100$	Remark
1							KCL
2							

Remarks:

Worksheet:

ASSIGNMENT NO: 7
ASSIGNMENT NAME: Verification of Thevenin's Theorem.
Theory: Any two terminal linear bilateral dc network can be replaced by an equivalent circuit consisting of a voltage source and a series resistor.

Circuit Diagram:



Required instruments & materials:

1. Trainer set.............................. 1 no.
2. Digital multimeter...................1 no.
3. Dry cell, size D-D, 1.5V.........4 nos.
4. Battery case for 3 cells............1 no.
5. Battery case for 1 cell..............1 no.
6. Jumper with crocodile clip.....According to necessary

Data:

OBS NO	Measure without source				Measure with source			
	R_1 (Ω)	R_2 (Ω)	R_L (Ω)	R_O (Ω)	E_1 (volt)	E_2 (volt)	V_O (volt)	$I_{L(meas)}$ (mA)
1								
2								

Theoretical Calculation						Remark
R_{Th} (Ω)	V_{Th} (Ω)	$1_{L(cal)} = \dfrac{V_{TH}}{R_{Th}+R_L}$ (mA)	% Error= $\dfrac{R_0 - R_{Th}}{R_0}\times 100$	% Error= $\dfrac{V_0 - V_{Th}}{V_0}\times 100$	% Error= $\dfrac{I_{L(cal)} - I_{L(meas)}}{I_{L(cal)}}\times 100$	

Remarks:

Worksheet: