



Department of Electrical Engineering

Subject: Instrumentation & Measurement

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Instr: Sir, Walid Jan

ID: 13045

Student Name : Muhammad Numan Asad

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Q1: Part: A:

A student mistakenly connects an ammeter in parallel in a circuit. what will happen? Explain briefly.

Ans: Ammeter Parallel:

An Ammeter is used to measure current in a circuit and current remains constant in series circuit.

If Ammeter is connected in parallel than because of its low resistance large amount of current will flow through it instead of the original circuit.

Explanation:

Since the Ammeter is a low impedance device connecting it in a parallel with the circuit would cause a short circuit damaging the Ammeter or the circuit it should be connected in series so that maximum current can pass through it for accurate measurement of current (I) moreover its resistance is very low if it is connected in parallel

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in a circuit. It will be the current and current can not be measured accurately. If you do not connected the Ammeter in series you will short the load basically excluding the resistance element of the circuit.

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Q 1 Part: B:

A student mistakenly connects a voltmeter in series in circuit what will happen? Explain Briefly.

Ans:

A voltmeter measures the potential difference across two parts in a circuit in parallel connection the voltage in the branches remains same and the resistance of the voltmeter is very high so very less amount of current flows through it and thus it doesn't disturb the original circuit.

Explanation:

If it is connected in series than it will just measure the potential difference between two points of a single wire which is obviously zero. Hence voltmeter is connected in parallel to measure voltage.

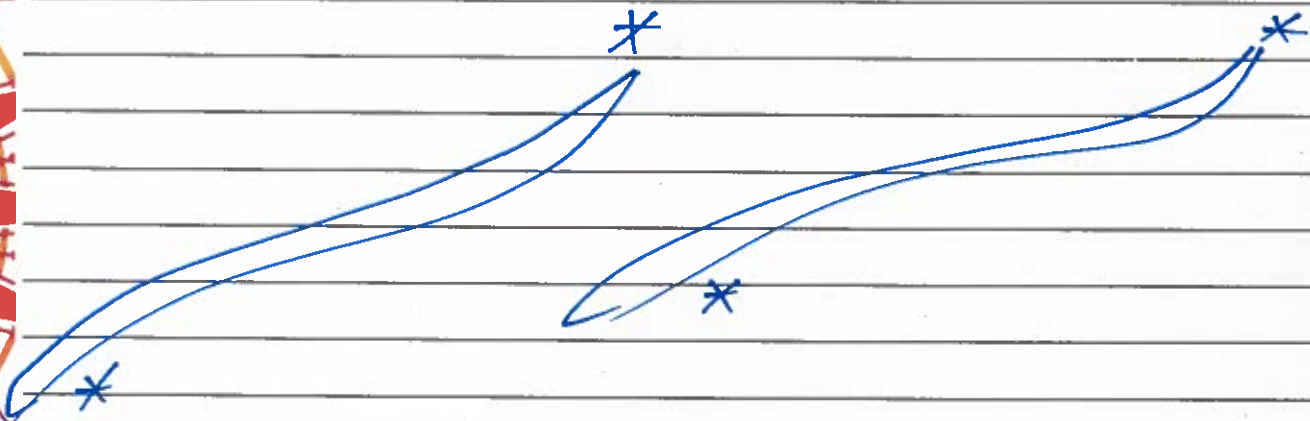
Problem with connecting a voltmeter in series:

If you break a circuit and insert a voltmeter than you introducing a big resistance into the circuit and so the current is small every where This means the bulb will be



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out which means you are not
measuring. The voltage across a bulb
when its lit.



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Q2: part : A:

Random error cannot be easily reduced in measurement. Justify this statement.

Ans:

Random error cannot easily reduce because we cannot control the raising in Temperature fluctuation of voltage and humidity of air.

This types of error is naturally.

→ caused by the sudden change in experimental conditions and noise or tiredness in the working persons.

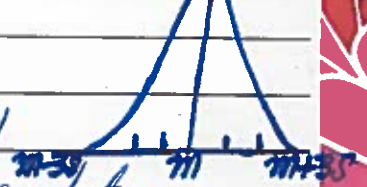
→ These error generally occurs due to sudden change in experimental conditions e.g. unexpected change in temp, humidity fluctuation

in voltage.

Random error often have a Gaussian normal distribution. In such cases, statistical methods may be used to analyze the data.

The means m of a number of measurement of the same quantity is the best estimate of that quantity and the standard.

Relative Frequency



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Q2: Part: B:

What are the different reasons due to which gross error occurs in measurement? Explain Briefly.

Ans:

GROSS ERROR:

This type of error occurs due to human negligence. It can be explained by below given

(A) A person reading pressure gauge 1.01 N/m^2 as 1.0 N/m^2 . It may be due to the person had habit of not properly remembering data at the time of taking down Reading.

(B) Reading of the instrument value before it reaches steady state.

(C) Calculating a derived measured wrongly like a person is calculating resistance from voltmeter and ammeter values so if the has due some using divisions than the value of resistance will be wrong.

Careful reading and recording of the data can reduce gross errors.

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Q3: Part: A:

What will happen if a spring is not connected will the coil of a moving coil galvanometer? Explain Briefly.

Ans:

Moving coil Galvanometer:

Have you ever wondered how the utility company knows how much power you use each month? In short it uses an electric meter. The galvanometer is an instrument used to determine the presence direction and the strength of an electric current in a conductor. When an electric current is passing through the conductor the magnetic needle tends to turn at right angles to the conductor so that its direction is parallel to the lines of induction around the

conductor and its north pole points in the direction in which these lines of induction flow.

A galvanometer is a type of ammeter. It is an instrument for detecting and measuring electric current.



Q3 Part (B)

A student is performing an experiment in the laboratory during which he finds out that the measuring instrument is giving a full scale deflection for a current of $10 \mu\text{A}$. He wants to measure a voltage of 20V . With the help of this measuring instrument. Now what should be the appropriate value of the resistor to be added with this instrument so that it can measure up to 20V ? Moreover should be resistor be connected in series or parallel with this instrument?

Given Data:

$$V = 20\text{V}$$

$$I_g = 10 \times 10^{-6}$$

Required: $R = ?$

Solution:

$$\Rightarrow V = I_g (G + R)$$

$$\Rightarrow V/I_g = G + R$$

$$\Rightarrow R = V/I_g - G$$

$$\Rightarrow R = V/I_g - G$$

$$\Rightarrow R = 20/10 \times 10^{-6} - G$$

$$\Rightarrow R = 20/10 \times 10^{-6} - 0$$

$$\Rightarrow R = 2,000,000$$

$$\Rightarrow \boxed{R = 2 \times 10^6 = 2 \text{ Mega } \Omega} \text{ Ans/}$$

The resistor $2 \text{ M}\Omega$ meaning 20 V
and connected in series.



THE END