Department of Electrical Engineering

Assignment

Date: 20/04/2020

Course Details

Course Title: Instrumentation and Measurement **Module:** 6th (BE)

Instructor: **Total Marks:** 30

Student Details

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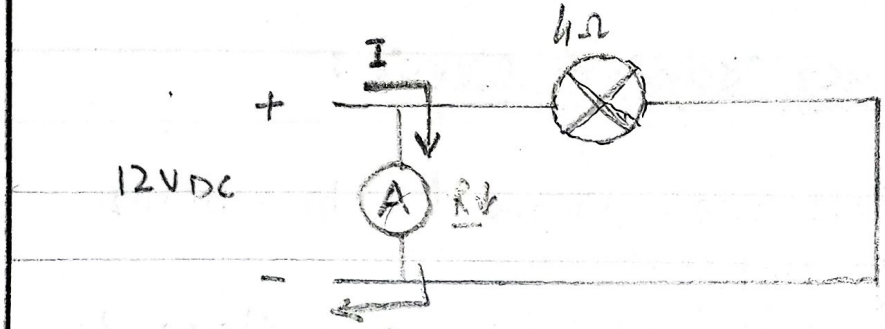
Q1.	**(a)**	A student mistakenly connects an ammeter in parallel in a circuit. What will happen? Explain briefly.	**Marks 05** **CLO 2**
	(b)	A student mistakenly connects a voltmeter in series in a circuit. What will happen? Explain briefly.	**Marks 05** **CLO 2**
Q2.	**(a)**	Random error cannot be easily reduced in measurements. Justify this statement.	**Marks 05** **CLO 1**
	(b)	What are the different reasons due to which gross error occurs in measurement? Explain briefly.	**Marks 05** **CLO 1**
Q3.	**(a)**	What will happen if a spring in not connected with the coil of a moving coil galvanometer? Explain briefly.	**Marks 05** **CLO 2**
	(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 μ 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 the resistor be connected in series or parallel with this instrument?	**Marks 05** **CLO 02**

Q 1

PART (A)

Ammeter:

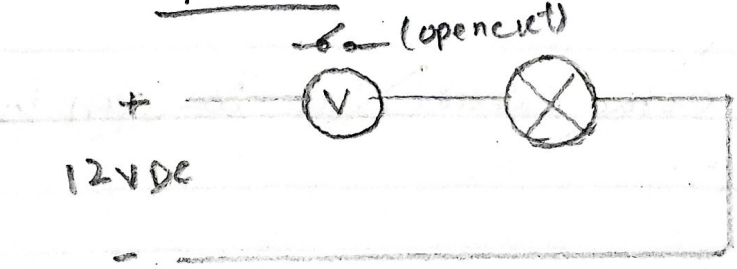
Ammeter has a very low resistance. If it is connected in parallel to circuit, the ckt will short & large amount of current will flow from the ammeter causing it to damage due to its low resistance. It can be consider as a short ckt.



PART (B)

Voltmeter:

Voltmeter has a very high resistance. If it is connect in series with the circuit, very small amount of current will flow through the ckt & voltmeter will show the potential drop b/w its two terminals. It can be considered as an open ckt.



Q 2

PART (A)

Random Error:

These error generally ~~caused by~~ occurs due to sudden change in experimental condition e.g: unexpected change in temperature humadity, fluctuation in voltage.

Because of these sudden changes random error cannot be reduced easily.

Ways to reduce random error:

1. Taking repeated measurements to obtain an average value.
2. Plotting a graph to establish a pattern & obtaining the line or curve of best fit. In this way, the discrepancies or errors are reduced.
3. Maintaining good experimental technique (e.g. reading from a correct position)

Q2

PART (B)

Gross Error:

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

(a) A person reading pressure guage $1.01\ N/m^2$ as $1.10\ N/m^2$.
It may be due to the person's bad 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 desired measured wrongly like a person is calculating resistance from voltmeter & ammeter values.
So if he has done some wrong division, then the value of resistance will be wrong.

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

Q 3

PART (A)

They are torsional springs providing the restoring force that pushes the pointer back to zero. It is the hair springs that make the deflection proportional to the force. And since the force is proportional to the current, it permits us to draw an analogue scale under the pointer & measure the current.

I = Controlling Torque

Spring = Restoring Torque

* when the coil is rotating
  OT > RT

* the coil will come back to its position
  RT > OT

Q 3

PART (B)

Problem :

Given Data :

$I_g = 10\,\mu A\ (10 \times 10^{-6})$

$V = 20\ v$

'Ig' Current passes through Galvanometer

Required :

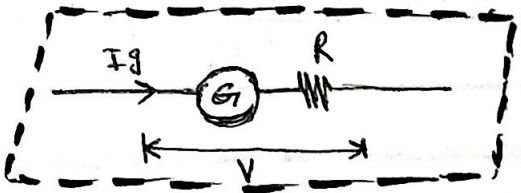
$R = ?$

'R' is the value of series Resistor for Voltmeter

Formula :

$V = IR$

$V = I_g(G+R)$



'G' is the value of Galvanometer Resistance.

Solution :

$V = I_g(G+R)$ ∴'G' is neglected

$V/I_g = G+R$ ∴ $G = 0$

$R = V/I_g - G$

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

$$R = \frac{20}{10 \times 10^{-6}}$$

$$R = \frac{20^2}{10_1 \times 10^{-6}}$$

$$R = \frac{2}{1 \times 10^{-6}} = \frac{2}{10^{-6}}$$

$$R = 2 \times 10^{6}\ \Omega = 2000000\ \Omega$$

$$R = 2 \text{ mega } \Omega$$

$$\boxed{R = 2\ M\Omega}$$ Ans

⇒ The Resistor Should be connected in Series with Galvanometer.
