

Department of Electrical Engineering

Assignment

Date: 20/04/2020

Course Details

Course Title: Instrumentation and Measurement

Module: 6th (BE)

Instructor: Sir Waleed Jan

Total Marks: 30

Student Details

Name: Bakht Zaman Gohar

Student ID: 13678

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 is 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 $10 \mu A$. 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

★ MID TERM ★

★ NAME :- BAKHT ZAMAN GOHAR

★ ID :- 13678

★ SEMESTER :- 6th

★ PAPER :- INSTRUMENTATION

8
MEASUREMENT

Q1:- (Part-a) A student mistakenly connects an ammeter in parallel in a circuit. what will happen? Explain briefly.

Answer:- If an ammeter connect in parallel in a circuit it can cause damage to ammeter.

★ Reason:-

An ideal ammeter has zero resistance whereas a non ideal ammeter has very small resistance. when we connect an ammeter in parallel, as we know the current always flow through low resistance path, so due to low resistance maximum amount of current will flow through the ammeter which can damage the ammeter.

Q1:- (Part-b) A student mistakenly connects a voltmeter in series in a circuit. What will happen? Explain briefly.

Answer:- If a voltmeter is connected in series in a circuit it can be considered as an open circuit.

* Reason:-

A voltmeter is used to measure potential difference across two points in an electrical circuit.

A voltmeter has high resistance & by connecting voltmeter in series in a circuit is equivalent to connecting a very high resistance in series with the circuit. By this only small insignificant amount of current will flow through the circuit & nearly results in an open circuit.

Q2:- (Part-a) Random error cannot be easily reduced in measurements.

Justify the statement.

Answer:- * Random error:-

Random errors are fluctuations in the measured data due to the precision limitations of measurement device

★ Statement Justification:-

Random errors can't be easily reduced in measurements because these error caused by unknown & unpredictable changes in the experiment. These error caused by many uncontrolled variable that are inevitable part of every measurements. Hence, Random error can't easily reduced measurements.

★ Example:-

In electronic circuit noise is always present in system & we can't predict that how many percentage error this noise can generate in measurement so this type of random errors can't be reduced easily.



(Part-b)

Q2:- what are the different reasons due to which gross error occurs in measurement? Explain briefly.

★ Gross Error:-

Gross errors are those type of error which is caused due to the experimenter carelessness or the failure of equipment.

* Reasons of Gross Error :-

This category basically takes into account human oversight & other mistakes while reading & recording of the readings.

This type of error is also caused due to mistake in using instruments or the failure of instruments.

* Example :-

The experimenter reads the 31.5°C reading while the actual reading is 21.5°C .

This happens because of the oversights.

The experimenter takes the wrong reading & because of which the error occurs in the measurement.

* How to Avoid :-

Some of the gross error can be easily detected but some of them are difficult to find.

To avoid these errors;

- The reading should be taken carefully.
- Two or more readings should be taken of the measurement quantity to point out the error.

Q3:- (Part - a) What will happen if a spring is not connected with the coil of a moving coil galvanometer? Explain briefly.

* Galvanometer :-

A galvanometer is an electro-mechanical instrument used for detecting & indicating an electric current.

* Function of Spring :-

When the current passes through the coil, a torque acts on it & it is deflected. This deflection causes the restoring torque in the spiral springs attached with the coil & the coil attains a steady deflection. The pointer attached to the coil moves on a scale & indicates the current.

* If Spring is not present :-

As the torque acts on the coil & due to which the restoring torque is stored in the spring & due to this restoring torque, it pushes the pointer back to zero when no current is passing through it. When spring is not connected then it will indicate maximum reading of galvanometer with any finite value of input current.

Q3:- (Part - b)

* Given data :-

$$I_g = 10 \mu\text{A}$$

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

* Required data :-

$$\text{Value of resistance} = R = ?$$

* Solution :-

As we know that

$$I_g = \frac{V}{R + G}$$

()

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

$$(I_g) \times R = V - G$$

As we need R

$$\text{So, } R = \frac{V}{I_g} - G \text{ put values}$$

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

G = resistance of Galvanometer which is zero

$$R = \frac{20}{10} \times 10^6 \Rightarrow 2 \times 10^6 = 2 \text{ mega } \Omega$$

* Result :-

So, Resistance = $R = 2 \text{ mega } \Omega$ & the resistance will be connected in series which decides the range of voltmeter.