

**Department of Electrical Engineering**  
**Assignment**  
**Date: 20/04/2020**

**Course Details**

**Course Title:** Instrumentation and Measurement  
**Instructor:** \_\_\_\_\_

**Module:** 6<sup>th</sup> (BE)  
**Total Marks:** 30

**Student Details**

**Name:**

**Mohsin ali**

**Student ID:**

**13746**

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

1)

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Paper: Mid Term  
Subject: EMI  
Teacher Name: Sir Waleed Jan

Part (A)

Q1:

ANS: An ammeter is always connected in Series because the purpose of the ammeter is to measure the current through the circuit. If it is connected in parallel it will result in the following consequence:

i) Damage to the ammeter:

Ammeter is a low impedance device. By connecting in parallel would result in short circuit and burn damage to the ammeter and ckt.

ii) incorrect measurement of ~~the~~ current

→ it is a very low impedance (Resistance) device and if connected in parallel it will bypass current and current cannot be measured accurately because it will be shorted to the load and current will take the

(2)

Low resistance path of ammeter.

### Summary

So an ammeter has a very low resistance. If put in parallel in a circuit, it may draw a heavy current which can result in burning of the moving coil. Hence we have put an externally low resistance as shunt to the ammeter.

Q1

Part (b)

ANS:

Voltmeter measures potential difference across two points in a circuit. It should be always connected in parallel because the voltage across the branches remains the same and due to high resistance, current flow through the voltmeter is very low and it does not disturb the original circuit. If it is connected in series by mistake

→ As voltmeter has high resistance, so no current will flow through the circuit.

→ It will only measure potential difference between two points which is obviously zero.

There will be no voltage drops.

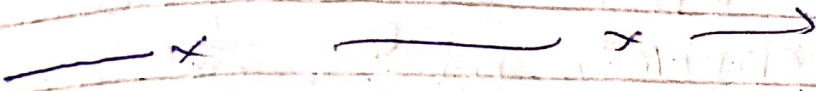
(3)

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because voltage in same line is zero.

### Summary:

Voltmeter ideally have infinite internal resistance, practically a large enough resistance, so if connected in series, a very small current will flow or no current will flow. Since no current flowing, voltmeter will show the voltage of the battery connected across.



Q.2

Part (a)

A Random error makes the measured value both smaller and larger than the true value. They are error of precision. Random errors occur by chance ~~change~~ and cannot be avoided. Random error is due to factors which we ~~don't~~, do not or cannot control.

→ Random error causes one measurement to differ slightly from the next. It comes from unpredictable change during an experiment. The main reasons for random error are limitations of instruments, environmental factors, and slight variations in procedure. For example:

i) When weighing ~~yourself~~ yourself on a scale you position yourself slightly differently each time.

ii) Measuring the mass of ~~a~~ a sample on an analytical balance may produce different values as air currents affect the balance or as water enters and leaves the specimen.

~~iii) Electronic noise~~

→ Because random error always occurs and cannot be predicted, it is important to take multiple data.

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(5)

Points and average them to get  
a sense of the amount of variation  
and estimate the true value -

(6)

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Q.2:

Part (B)

ANS:

Gross error

~~it is called human error and it~~  
Gross error<sup>not</sup> occurs in reading, recording or calculating Measurement result. It may occur during the experiment due to experiment fault. He may read or record value different than actual value.

→ it may be due to reading the <sup>instrument</sup> with out setting properly

→ it may be taking observation in wrong measure with out bothing about the source of error.

The best example of these error is a person or operator reading pressure gage  $1.01 \text{ N/m}^2$  as  $1.10 \text{ N/m}^2$  it may be due to the person's bad habit of not properly remembering data of the time of taking down reading, writing and calculations and then presenting the wrong data later. This may be the reason for gross errors in the reported data and such error may end up in.

Q 3

Part (A)

ANS:

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 (scale under) the pointer and measure The current.

- A Galvanometer is an instrument used for detecting and measuring current moving coil galvanometer can measure smallest amount of current.

The Spring play very Important role in The function of galvanometer with out spring The following function of galvanometer may be effected

→ There will be no steady angular deflection with spring because there will be no counter Torque for balancing Magnitude Torque.

→ There will be no restoring force to push back The pointer zero and The deflection measurement is disturb.



(2)

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→ with out Spring we cannot Measure  
 The current because it is  
 Spring That makes deflection  
 proportional to the force  
 and proportional to the current

→ x → x → x →

Q3 part (b)

Given Data:

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

$V = 20V$

$R = ?$

Solution:

$V = I_g(G + R)$

$\frac{V}{I_g} - G = R$  <sup>if we neglect.</sup>

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

$R = 2000000$

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

~~$R = 2 \text{ mega}$~~   $R = 2 \times 10^6 \Omega$

if we find through ohm law

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

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

$R = 0 \Omega$