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

Course Details

Course Title: Instrumentation and Measurement **Module:** 6th (BE)
Instructor: Sir Engr waleed jan **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**

Answer Sheet

Q(1)(a)

Ans. An ammeter is designed to be connected in series so the current passes through it. Since you don't want to change the original circuit, it's best if the ammeter has a very low resistance. Adding a very low resistance in series means the current won't decrease that much and the low resistance takes a small share of the voltage.

The problems with connecting an ammeter in parallel

If you connect an ammeter in parallel then there are two problems.
The first is that you haven't put the ammeter in the way of the current you're trying to measure so you can't be measuring it properly.
The second is that the current drawn increases so you're changing the current you're trying to measure. A low resistance in parallel with a high resistance has an effective resistance of a little less than the low resistance.
The low resistance ammeter makes the effective resistance of the circuit very low and so the current is very big. The ammeter actually shorts out the component it's trying to measure the current through. This can damage the ammeter because a very big current flows in it.

Q(1)(b)

Ans. A combination of a high resistance (like a voltmeter) connected in parallel with a smaller resistance (like a bulb) has an effective resistance of a tiny bit less than the small resistance (the bulb). In other words the effect is pretty much the same as just having the bulb alone, which is what we want. If the voltmeter had a very low resistance then the effective resistance would be a little less than the voltmeter itself. This would be much less than just the bulb on its own so by adding the voltmeter you'd be changing the circuit you were trying to measure.

The problem with connecting a voltmeter in series

If you break a circuit and insert a voltmeter then you're introducing a big resistance into the circuit and so the current is small everywhere. This means the bulb will be out, which means you're not measuring the voltage across a bulb when it's lit.

Q(2)(a)

Ans.

A random error makes the measured value both smaller and larger than the true value; they are errors of precision. Chance alone determines if the value is smaller or larger. Reading the scales of a balance, graduated cylinder, thermometer, etc. produces random errors. In other words, you can weigh a dish on a balance and get a different answer each time simply due to random errors. They cannot be avoided; they are part of the measuring process. Uncertainties are measures of random errors. These are errors incurred as a result of making measurements on imperfect tools which can only have certain degree of precision.

Error Reducing

Random error can never be eliminated because instruments can never make measurements with absolute certainty. However, it can be reduced by making measurements with instruments that have better precision and instruments that make the measuring process less qualitative.

Q(2)(b)

Ans.

Reason of gross error in measurement

- Also called human error, these errors arise from mistakes from the experimenter, like laziness, carelessness or ineptitude.
- Can be reduced by experience, practice and care.
- Mostly hard to correct, and the experiment would need to be repeated.
- Examples: Spilling solutions, not following the procedure correctly, not using equipment properly, etc.

Q(3)(a)

Ans.

spring applies a restoring torque when the coil rotates. When the magnitude of both the torques are the same, the coil experiences a rotational equilibrium. If spring is not connected with coil then coil don't come in intial or zero position.

Q(3)(b)

Ans.

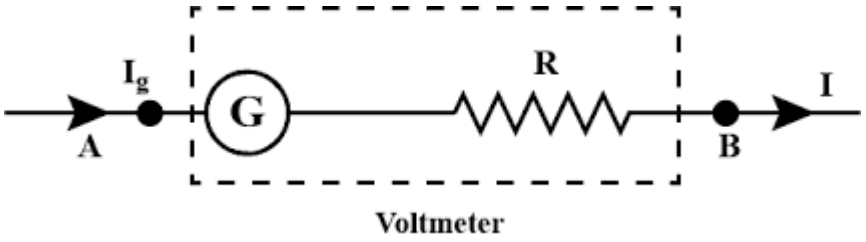
Solution:

Current I =

Voltage v = 20

Resistor series =?

By formula



$$R_h = \frac{v}{ig} - R_g$$

$$R_h = \frac{20}{10 * 10^{-6}}$$