(DC1-3) Determination of Unknown Resistance, Meter Bridge

Aim of experiment

Determination of an unknown resistance using a Meter Bridge

Tools

Meter Bridge – D.C power supply – set of standard resistances – unknown resistance – galvanometer or sensitive voltmeter.

Theory of experiment

ABCD, *figure 1,* is a diagrammatic form of the *Wheatstone bridge*. At the point of balance, i.e. when the galvanometer shows no deflection, we find that

$$V_{AB} = V_{AD}\ , \quad I_1R_1 = I_2R_3 \quad (1)$$

$$V_{BC} = V_{DC}\ , \quad I_1R_2 = I_2R_4 \quad (2)$$

From (1) and (2)

$$R_1 / R_2 = R_3 / R_4 \qquad (3)$$

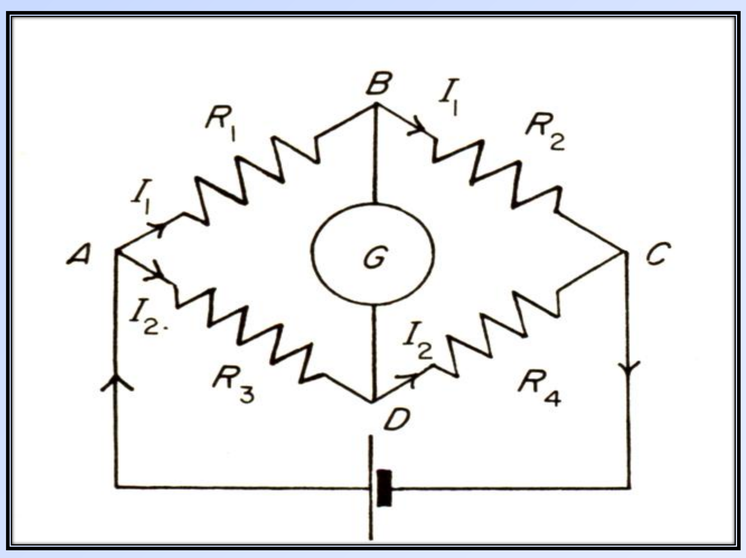

Figure1 Wheatstone bridge

The meter bridge of *figure 2* is a special case of Whetstone bridge, *figure 1*. If the wire of meter bridge has a uniform cross section, then its resistance is proportional to its length

Equation (3) then yields

$$R_1 / R_2 = l_1 / l_2 \quad (4)$$

So if R_1 is known and R_2 is unknown and at the point of balance, l_1 and l_2 are measured, then one can determine the unknown resistance, R_2.

The resistance R_2 can be a result of series or parallel connection of known resistances, so one can verify the series and parallel resistances connection laws.

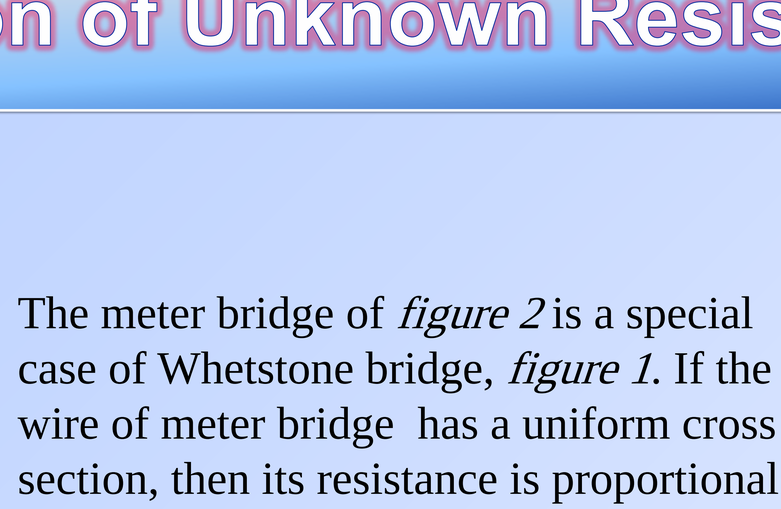

Figure 2 Meter bridge

Procedures

1- Switch on the circuit power

2- Connect up the bridge as shown in *figure (1)*

3- Check all connections, and adjust the power supply on ≈ 1 Volt.

4- Insert the first unknown resistance R_{21}

5- Move the slider along the wire until a point of balance is obtained.

5- Measure l_1 and l_2

6- Determine the value of unknown resistance R_{21} from equation (4).

7- Repeat the previous steps to determine the resistances R_{22}.

8-Repeat the previous steps to determine the equivalent of R_{21} *and* R_{22} resistances connected in series and parallel in place of resistance R_2.

Results

1-First resistance R_{21}

R_3= Ω

At balance

l_1 = cm and l_2 = cm

R_{21} = Ω

2-Second resistance R_{22}

R_3= Ω

At balance

l_1 = cm and l_2 = cm

R_{22} = Ω

3- For series connection

R_3= Ω

At balance R_{2s} = Ω

4-For parallel connection

R_3= Ω

At balance

l_1 = cm and l_2 = cm

R_{2p} = W

5-Comment on the results

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