3055 BA SANGAM COLLEGE

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WORKSHEET 17

SCHOOL: BA SANGAM COLLEGE **YEAR: 13**

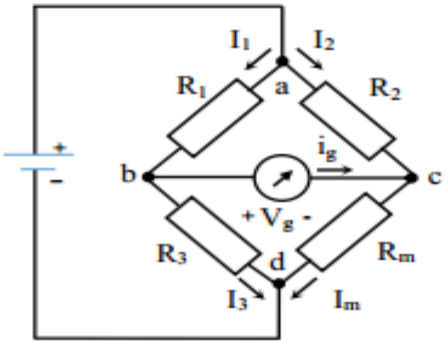
SUBJECT: PHYSICS **NAMEOF STUDENT: _____**

STRAND	**5 - DIRECT CURRENT**
SUB-STRAND	**5.2 – The Wheat stone Bridge**
LEARNING OUTCOME	To understand how a wheat stone bridge works

The Wheat stone Bridge

This is a special circuit that can be used to determine the resistance of an unknown resistor by comparison with three other resistances.

The galvanometer is used to detect the condition $I_g = 0$. When the circuit satisfies the condition $I_g = 0$ we say that "the bridge is balanced". It is always true that $V_g = 0$.



To find the value of the unknown resistor, use

$$\frac{R_3}{R_1} = \frac{R_m}{R_2} \qquad R_m = \frac{R_3}{R_1} R_2$$

EXAMPLE

1) Consider using a Wheatstone bridge having $R_1 = 200\ \Omega$ and $R_2 = 2000\ \Omega$ to measure a resistance R_m. The bridge is balanced by adjusting R_3 until $R_3 = 250\ \Omega$. What is the value of R_m?

$$\frac{R_3}{R_1} = \frac{R_m}{R_2}$$

$$\frac{250}{200} = \frac{R_m}{2000}$$

$$R_m = \frac{250}{200}(2000)$$

$$R_m = 2500\,\Omega \quad \text{or} \quad 2.5\ \text{k}\Omega$$

2) In the Wheatstone bridge circuit shown in Figure 5.23, R_1 and R_2 are 200 Ω and 300 Ω resistors. R_m is a resistor of unknown resistance. The bridge is balanced when R_3 is set to 180 Ω. Calculate the resistance of R_m.

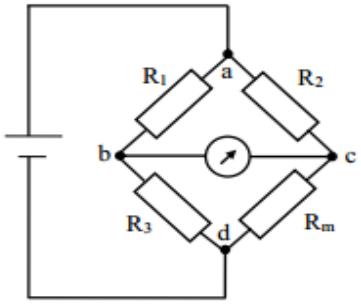


Figure 5.23

$R_1 = 200\Omega \quad R_2 = 300\Omega \quad R_3 = 180\Omega \quad R_1 = ??$

$$R_m = \frac{R_3}{R_1} R_2$$

$$R_m = \frac{180}{200}(300)$$

$$R_m = 270\ \Omega$$

EXERCISE

1) Use the circuit in Figure 5.24 to answer the following questions.

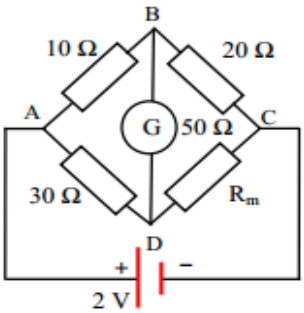


Figure 5.24

a) Name the circuit formed.

b) What is current flowing in arm BD?

c) State the two laws used to find the current in the different branches of this circuit.

d) Calculate the value of unknown resistance.

2) Figure 5.25 below shows a Wheatstone bridge connection between 'a' and 'b'. Calculate the value of X, if the bridge is balanced.

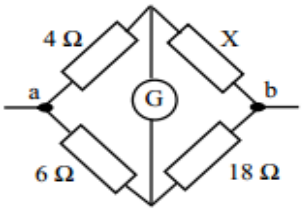


Figure 5.25

SOLUTION