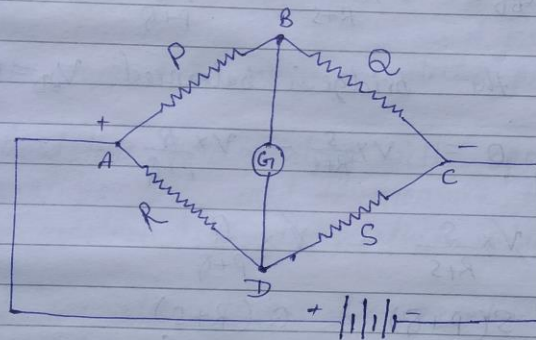


**B.Sc. Part-2 Physics (Hons) Paper-iv, Lecture-19 on the topic  
"Wheatstone Bridge and its Applications."**

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B.Sc. Part-2, Physics (Hons), Paper-IV.  
Lecture-19

\* Wheatstone Bridge :->

The most common and simplest bridge network to find the resistance is the wheatstone bridge. This bridge is used where the small changes in resistance are to be measured like in sensor applications. This is used to convert a resistance change to a voltage change of a transducer.



This bridge is used to find the unknown resistance very precisely by comparing it with a known value of resistances.

In this bridge null or balanced condition is used to find the resistance.

For the bridge balanced condition voltage at point B and D must be equal. Hence, no current flows through the galvanometer.

For getting the balanced condition one of the resistances must be variable.

From figure,

(2)

$$\text{The voltage at point D} = V \times \frac{S}{R+S}$$

$$\text{The voltage at point B} = V \times \frac{Q}{P+Q}$$

The voltage ( $v$ ) across galvanometer or between B and D is

$$V_{BD} = V \times \frac{S}{R+S} - V \times \frac{Q}{P+Q}$$

when the bridge is balanced  $V_{BD} = 0$

So,

$$0 = V \times \frac{S}{R+S} - V \times \frac{Q}{P+Q}$$

$$\cancel{V} \times \frac{S}{R+S} = \cancel{V} \times \frac{Q}{P+Q}$$

$$S(P+Q) = Q(R+S)$$

$$SP + \cancel{SQ} = QR + \cancel{SQ}$$

$$SP = QR$$

$$\boxed{\frac{P}{Q} = \frac{R}{S}}$$

This is the condition to balance the bridge.

And for finding the unknown value of resistance

$$\boxed{S = R \times \frac{Q}{P}}$$

From the above equation unknown resistance ( $S$ )

(3)

Can be computed from the known value of resistance  $R$  and the ratio  $Q/P$ .

Therefore, most of the cases  $Q$  and  $P$  values are known and fixed and the ' $R$ ' value is variable so the null value is achieved and the bridge gets balanced.

\* Applications of wheatstone bridge  $\Rightarrow$

- ① The wheatstone bridge is used for measuring the very low resistance values precisely.
- ② wheatstone bridge along with operational amplifier is used to measure the physical parameters like, temperature, strain, light etc.
- ③ We can also measure the quantities capacitance, inductance and impedance using the variation on the wheat stone bridge.