BRIDGE CIRCUITS

Introduction:

A bridge circuit in its simplest form consists of a network of four *resistance arms* forming a closed circuit. A source of current is applied to two opposi te junctions. The current detector is connected to other two junctions.

The bridge circuits use the comparison measurement methods and operate on null-indication principle. The bridge circuit compares the value of an unknown component with that of an accurately known standard component. Thus *the* accuracy depends on the bridge components and not on the null indicator. Hence high degree of accuracy can be obtained.

Advantages of Bridge Circuit:

The various advantages of the bridge circuit are,

1) The balance equation is independent of the magnitude of the input voltage or its source impedance. These quantities do not appear in the balance equation expression.

2) The measurement accuracy is high as the measurement is done by comparing the unknown value with the standard value.

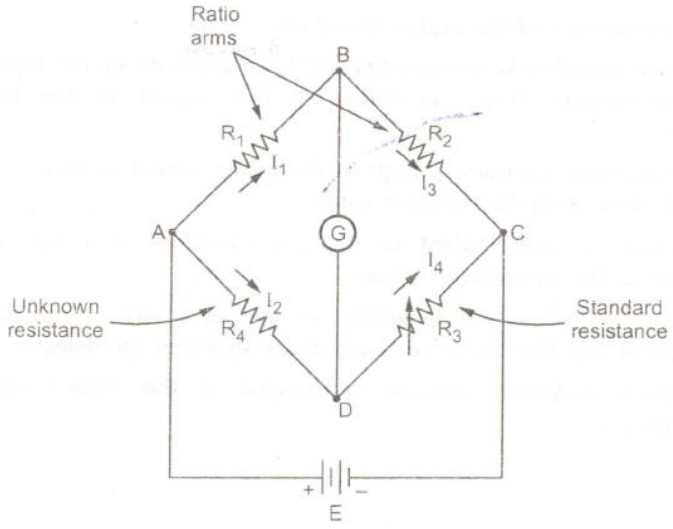
3) The accuracy is independent of the characteristics of a null detector and is dependent on the component values.

4) The balance equation is independent of the sensitivity of the null detector, the impedance of the detector or any impedance shunting the detector.

5) The balance condition remains unchanged if the source and detector are interchanged.

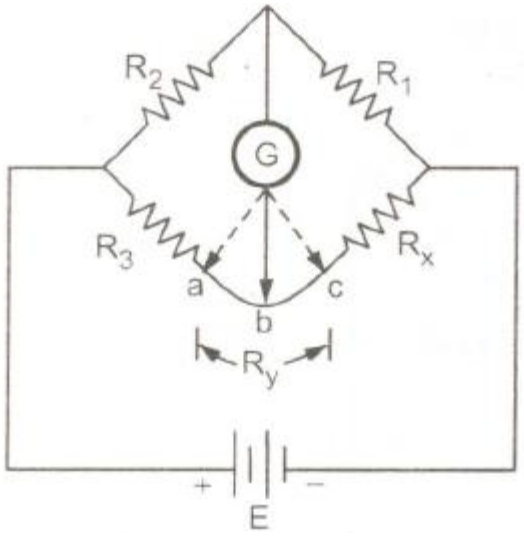
Wheatstone's bridge:

The bridge consists of four resistive arms together with a source of e.m.f. and a null detector. The galvanometer is used as a null detector.



The arms consisting the resistances R] and R2 are called ratio arms. The arm consisting the standard known resistance R3 is called standard arm. The resistance R4 is the unknown resistance to be measured. The battery is connected between A and C while galvanometer is connected between Band D.

Kelvin bridge:



In the Wheatstone bridge, the bridge contact and lead resistance causes significant error, while measuring low resistances. Thus for measuring the values of resistance below 1 -n, the modified form of Wh~tstone bridge is used, known as Kelvin bridge. The consideration of the effect of contact and lead resistances is the basic aim of the Kelvin bridge**.**

The resistance Rv represents the resistance of the connecting leads from R., to R,. The resistance Rx is the unknown resistance to be measured.

\ The galvanometer can be connected to either terminal a, b or terminal c. When it is connected to a, the lead resistance Ry gets added to Rx hence the value measured by the bridge, indicates much higher value of Rx.

If the galvanometer is connected to terminal c, then Ry gets added to R3. This results in the measurement of Rx much lower than the actual value.

The point b is in between the points a and c, in such a way that the ratio of the resistance from c to b and that from a to b is equal to the ratio of R] and R2.

$$\frac{R_{cb}}{R_{ab}} = \frac{R_1}{R_2}$$

Source : http://elearningatria.files.wordpress.com/2013/10/ece-iii-electronic-instrumentation-10it35-notes.pdf