

Experiment: 3

Measurement of the Low Resistance by using Kelvin Double Bridge Method.

EQUIPMENTS

- Regulated Dc Supply.
- Standard resistance coil.
- Kelvin's Double Bridge kit.
- Digital Multimeter.
- Patch codes.

THEORY

Kelvin's bridge is a modification of whetstone's bridge and always used in measurement of low resistance. It uses two sets of ratio arms and the four terminal resistances for the low resistance consider the ckt. As shown in fig 3.1. The first set of ratio P and Q. The second set of ratio arms are p and q are used to connected to galvanometer to a pt. d at an Approx. potential between points m and n to eliminate the effects of connecting lead of resistance r between the known std. resistance 's' and unknown resistance R. The ratio P/Q is made equal to p/q. under balanced condition there is no current flowing through galvanometer which means voltage drop between a and b, E_{ab} equal to the voltage drop between a and c, E_{amd} .

Now
$$E_{ad} = P/P + Q \quad (3.1)$$

$$E_{ab} = I[R + S + \{(p + q)r/p + q + r\}] \quad (3.2)$$

$$E_{amd} = I[R + p/p + q \{(p + q)r/p + q + r\}] \quad (3.3)$$

For zero deflection

$$E_{ac} = E_{ad} \quad (3.4)$$

$$[P/P + Q]I[R + S + \{(p + Q)r/p + q + r\}] = I[R + pr/p + q + r] \quad (3.5)$$

Now, if

$$P/Q = p/q \quad (3.6)$$

Then eq. (3.5) becomes

$$R = P/Q = S \quad (3.7)$$

Equation (3.7) is the usual working equation. For the Kelvin's Double Bridge .It indicates the resistance of connecting lead r. It has no effect on measurement provided that the two sets of ratio arms have equal ratios. Equation (3.5) is useful however as it shows the error that is introduced in case the ratios are not exactly equal. It indicates that it is desirable to keep r as small as possible to minimize the error in case there is a diff. between the ratio P/Q and p/q.

$$R = P/QS \quad (3.8)$$

EXPERIMENT

Circuit Diagram:

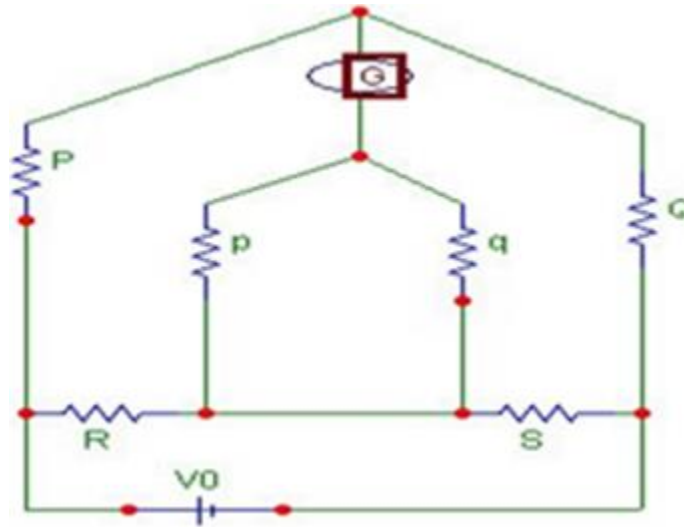


Figure 3.1 (Kelvin Double Bridge)

Procedure:

- The circuit configuration on the panel is studied.
- Supply is switched on and increased up to 5v.
- The unknown resistance is connected as shown in Fig 3.1.
- The value of P, Q was selected such that $P/Q = p/q$
- S was adjusted for proper balance and balance value of s was balanced.
- The value of known resistance was calculated.

Precautions:

- Check all the connections before turning ON the power supply.
- Do not exceed the value of 5v.
- Note the readings accurately.

RESULTS

Observation Table:

P (ratio arm resistor)	Q (ratio arm resistor)	S Standard resistor	R (measured value)	R (actual)

Table 3.1 (Observations Kelvin Double Bridge)

CONCLUSION

Instructor Signature: _____

Date: _____