Date : 11-10-'22

Experiment No : 1

Experiment Name : Measurement of unknown resistance with the help of standard resistance using wheatstone bridge method.

Theory :

A very important device used in measurement of medium resistance is the Wheatstone bridge. The Wheatstone bridge is an instrument for making comparison measurements and operates upon a null indicator principle. That means this indication is independent of the calibration of the null indicatin instrument or any of its characteristics. For this reason very high degree of accuracy can be achieved using wheatstone bridge.

From the '**Circuit Diagram'** part we can see that there are 4 resistive arms in the wheatstone bridge. They are called P,Q,R,S. Here P and Q is called 'ratio arms' and S is called standard arms. Here a Galvanometer which is usually used as a null detector is connected across point b and d. The current flow across galvanometer depends on wheather the circuit is balanced or not. When the potential difference between the point 'd' and 'a' is equal to the potential difference between the point 'b' and 'a' , it is called balanced state.

So we can say that $I_1P = I_2R$ ..... (1)

For the Galvano meter current to be zero, following onditions also exists.

$I1=I3=\frac{E}{P+Q}$..... (2)

And $I2=I4=\frac{E}{R+S}.....(3)$

Combning eqution 1,2 and 3 we get ,

$$\frac{P}{P+Q}=\frac{R}{R+S}.....(4)$$

From which we get , PS=QR..... (5)

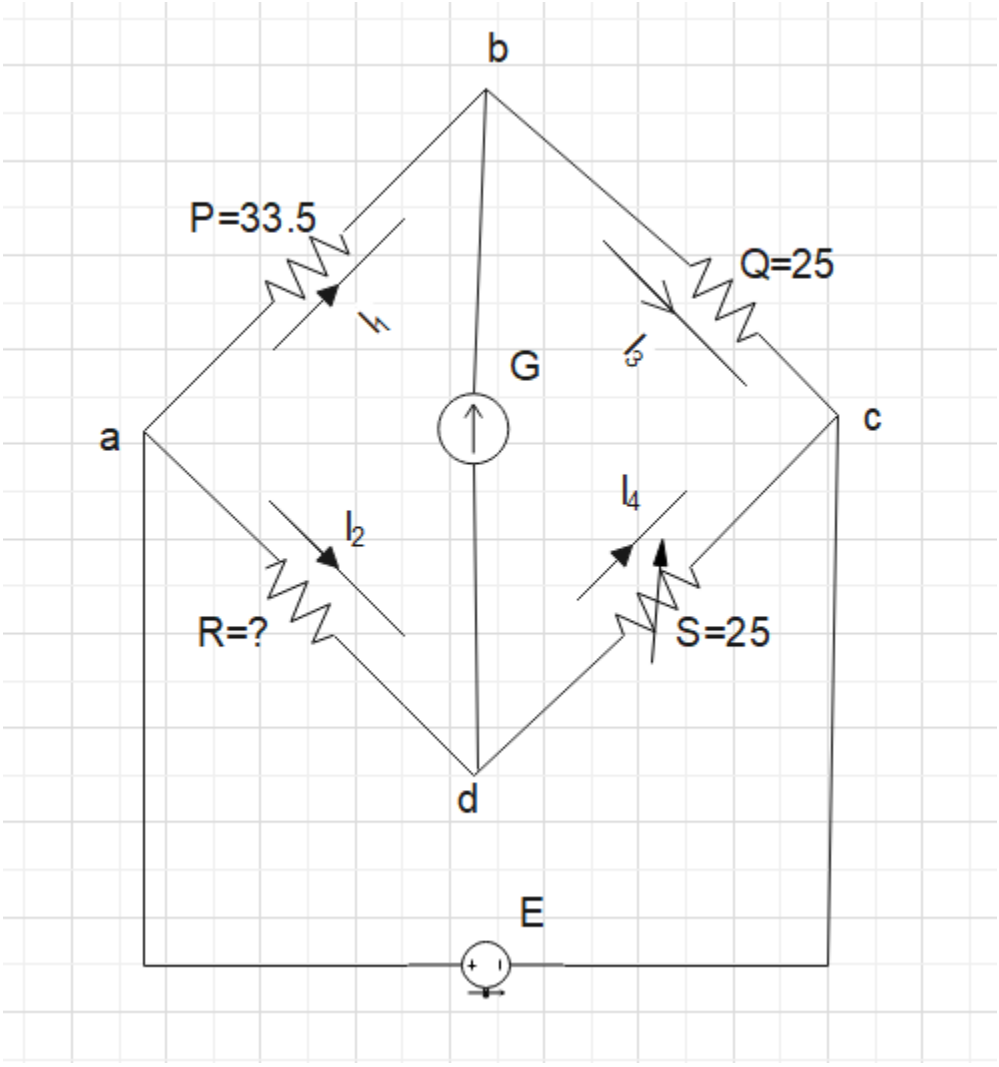
Equation 5 is a well known equation for balanced Wheatstone bridge. If three of them are known we can eaily find the fourth one by the equation ,

R=$S\frac{P}{S}$ ..... (6)

Required Apparatus:

1. Resistors (37 ohm , Quantity – 4)
2. Galvano Meter
3. Connecting Wire
4. DC Supply (6V)
5. Multi Meter

Circuit Diagram :



Procedure :

First of all we have measured the resistance of the 4 resistors using multimeter. The resistance of R which was found to be 33.3 . At the time of measuring , the circuit was not connected and was out of power. Then we connected the circuit and made the wheatstone bridge balanced by varying the resistance S. And at the value of S= 25 , we found the circuit to be balanced and no current was flowing through the Galvanometer. Then we calculated the value of R by using the equation 6 .

Data Table:

SI No.	P	Q	S	R_{calc}	R_m	%E
01	33.5	25	25	33.5	33.3	0.5970

Calculation :

From the equation 6,

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

$=25*\frac{33.5}{25}$

$=33.5$

$\%E = \frac{33.5-33.3}{33.5}*100$

$= 0.5970\ \%$

Discussion :

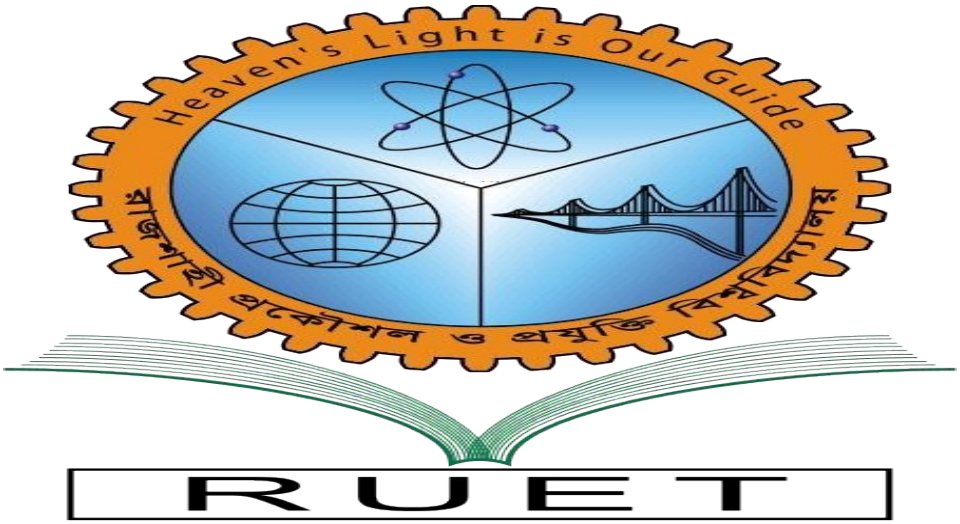
The calculated value of the R was not exactly equale to the measured value of R by multimeter. It was slightly different from the actual resistance. It is because of the voltage drop in the wires .

But still Wheatstone bridge was better than other ordinary ohommeter. We can see we found only 0.5970% of error. Whereas the error in the other ohmmeter is found to be 3% and 5% .

So wheatstone bridge was a better instrument to measure resistance.

Conclusion :

The circuit was connected correctly. The resistance that was found in the experiment was very close to the actual resistance.



Department of Electrical & Computer Engineering

Course No: ECE 3220

Course Title:

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