PHYSICS PRACTICAL SHEET

Date .....
Class ..... C.S.E .....
Roll No. ..... 25 .....
Shift ..... Day .....
Object of the Experiment (Block Letter)

8/8/19-11-2023

Experiment No. ..... 1 .....
Group ..... T .....
Sub. ..... PHY102 .....
Set .....

MEASUREMENT OF LOW RESISTANCE USING CAREY-FOSTER'S BRIDGE

Apparatus Required:

i) Carey-Foster's bridge
ii) Two equal resistance
iii) A fractional resistance box
iv) Cell
v) Connecting wire
vi) Sensitive galvanometer & jockey

Theory:

Carey-Foster's bridge is modification of meter bridge. The arrangement is similar to wheatstone bridge. P and Q are two equal ratio arms. Let D be the balance point, then X along with the resistance of wire aD and Y along with resistance of wire bD form the other two arms.

If S is resistance/cm wire, λ_1 and λ_2 are the end resistance at 'a' and 'b' respectively, then the balance point is obtained at D, where $aD = l_1$.

$$\frac{P}{Q} = \frac{X + l_1 S + \lambda_1}{Y + (100 - l_1)S + \lambda_2} \quad \text{— (i)}$$

when X and Y are interchanged,

$$\frac{P}{Q} = \frac{Y + l_2 S + \lambda_1}{X + (100 - l_2)S + \lambda_2} \quad \text{— (ii)}$$

Comparing (i) and (ii), we get.

$$\frac{X + Y + 100S + \lambda_1 + \lambda_2}{Y + (100 - l_1)S + \lambda_2} = \frac{X + Y + 100S + \lambda_1 + \lambda_2}{X + (100 - l_2)S + \lambda_2}$$

or, $Y - X = (l_1 - l_2)S.$

$\therefore X = Y - Sd.$

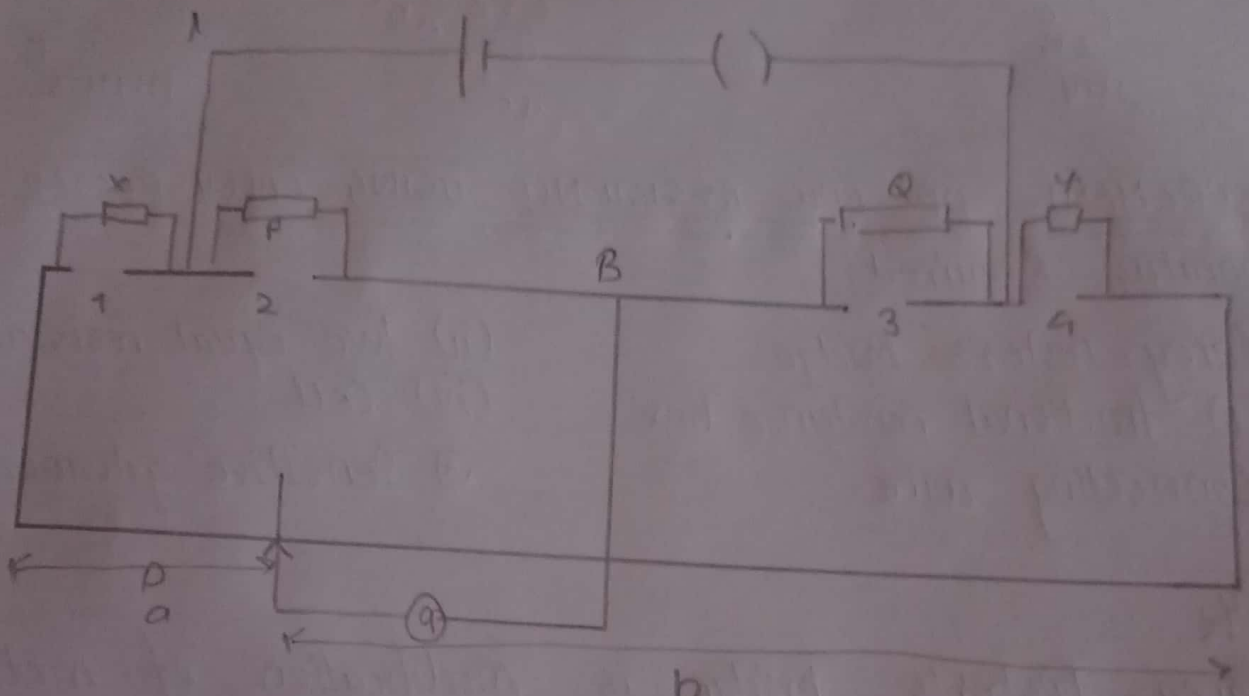

Fig: Schematic diagram of circuit of Carey-Foster's bridge

OBSERVATIONS:

Balance point with $Y=0$ in the right gap and X zero in left gap $(x) = 51.9\,cm$

Balance point with $Y=0$ in left gap and X zero in right gap $(y) = 46\,cm$.

Correction $\delta L = (x-y) = 5.9\,cm$

Table 1

Nog obs	X	Y	Position of balance Left	Right	Shift $Sh = (l_1 - l_2)$	Corrected shift $d = Sh - \delta L$	$\rho = Y/d$
1	0	0.1	53.7	43.9	9.8	3.9	0.025
2	0	0.2	56.3	42	14.3	8.4	0.023
3	0	0.3	58.1	39.9	18.2	12.3	0.0243
4	0	0.4	59.9	38.1	21.8	15.9	0.025
5	0	0.5	61.7	35.7	26.0	20.1	0.024

Mean $\rho = 0.024\,\Omega/cm$

Table 2:

No of obs	Y	Position of balance		Shift	Corrected	Unknown resistance
		Left	Right	$sh = l_1 - l_2$	Shift $d = sh - \delta L$	
1	0.1	36.2	62.6	-26.4	-32.3	0.88
2	0.2	38.6	60.5	-21.9	-27.8	0.87
3	0.3	40.4	58.6	-18.2	-24.1	0.88
4	0.4	42	56.6	-14.6	-20.5	0.89
5	0.5	44.8	54.1	-9.3	-15.2	0.87

Mean $X = 0.88\ \Omega$

RESULT:

The value of given unknown resistance is $0.88\ \Omega$

PRECAUTIONS:

(i) The end of connecting wires, copper strip, and leads for resistance must be cleaned properly

(ii) The unknown resistance should be connected using thick copper leads.

(iii) The plugs of fractional resistance box should be tight.