B. Sc. Part II

Paper IV

Current electricity

Paper IV

Dr. Shiva Kant Mishra
Dept of Physics HDJC

Current electricity.

Short Notes

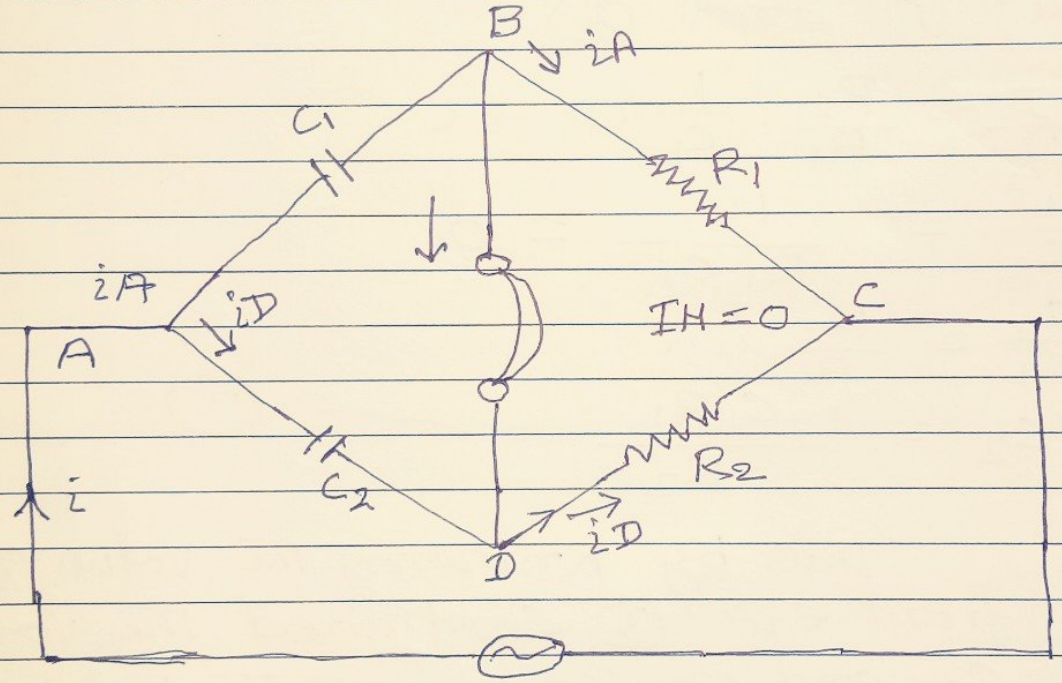
Date

Expt. No.

Page No.

De Sauty Bridge :-

De Sauty Bridge is same as wheat-stone bridge whose source is audio frequency oscillator and detector is head-phone by which comparison of capacitances of two capacitor. As shown in figure a head phone H is used in place of Galvanometer in De Sauty bridge. C_1 and C_2 are two capacitors whose capacitances are to be compare and R_1 and R_2 are two inductless resistance.



Keeping the value of R constant, the value of R_2 is as changed that the passed current ||| across the head phone become zero and no any sound be heard in the ear by headphone.

Teacher's Signature

This position is called the balanced condition of bridges.

On this position by the Kirchhoff's law in the circuit ABDA. we get.

$$-j\frac{1}{C_1\omega} i_A \left(-j\frac{1}{C_2\omega}\right) i_D = 0$$

or $$\frac{j}{\omega}\left(\frac{i_D}{C_2} - \frac{i_A}{C_1}\right) = 0 \quad \text{——} \quad (1)$$

By the Kirchhoff's law in BCDB circuit we get

$$R_1 i_A - R_2 i_D = 0$$

or $$i_A = \frac{R^2}{R_1} i_D \quad \text{——} \quad (2)$$

By equn (1) and (2)

$$\frac{i_D}{C_2} - \frac{R_2}{R_1} \cdot \frac{1}{C_1} i_D = 0$$

$$\therefore \frac{1}{C_2} = \frac{R_2}{R_1 C_1} = 0$$

or $$\frac{C_2}{C_1} = \frac{R_2}{R}$$

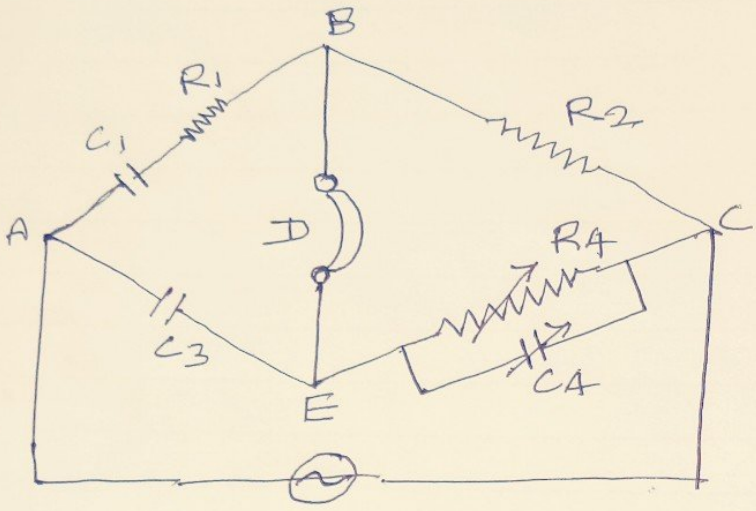
or $$C_2 = \frac{C_1 R_1}{R_2} \quad \text{——} \quad (3)$$

Thus by knowing the value of R_1 and R_2 from equn (3) compaired the value of C_1 and C_2 and on knowing the value of any one C_1 or C_2 the value of other is also known.

——

Schering Bridge :-

Schering bridge is same as wheat stone bridge whose source is also audio frequency oscillator and detector is head phone by which the capacitance of low value capacitor is measured. The capacitor of unknown capacitance is connected in arm AM and a virtual resistance R_1 is connected in its series as shown in figure.



A standard capacitor C_3 is connected in arm AE, whose virtual resistance is negligible Non-inducting resistance R_2 and R_4 is connected in the rest arm BC and EC. A variable graduated air capacitor C_4 is attached in parallel of R_4. In an equilibrium condition, we get

$$\frac{R_1 + \frac{1}{j\omega C_1}}{R_2} = \frac{1}{j\omega C_3}\left(\frac{1}{R_4} + j\omega C_4\right)$$

or. $R_1 R_4 j\omega C_3 + \frac{R_4 C_3}{C_1} = R_2 + R_2 R_4 j\omega C_4$

Date

Page No.

Expt. No.

Equating its imaginary parts, we have

$$R_1 R_4 C_3 = R_2 R_4 C_4$$

or $$\frac{R_1}{R_2} = \frac{C_4}{C_3} \quad \text{——— (1)}$$

Again equating its real parts, we have

$$\frac{R_4 C_3}{C_1} = R_2$$

or $$C_1 = C_3 \frac{R_4}{R_2} \quad \text{——— (2)}$$

Thus knowing the value of C_1, the value of C_3 is found.