

Marwari college Darbhanga

Subject---physics (Hons)

Class--- B. Sc. Part 2

Paper –04. ; Group—A

Topic--- Anderson Bridge

Lecture series ---65

By:-. Dr. Sony Kumari,

Assistant professor

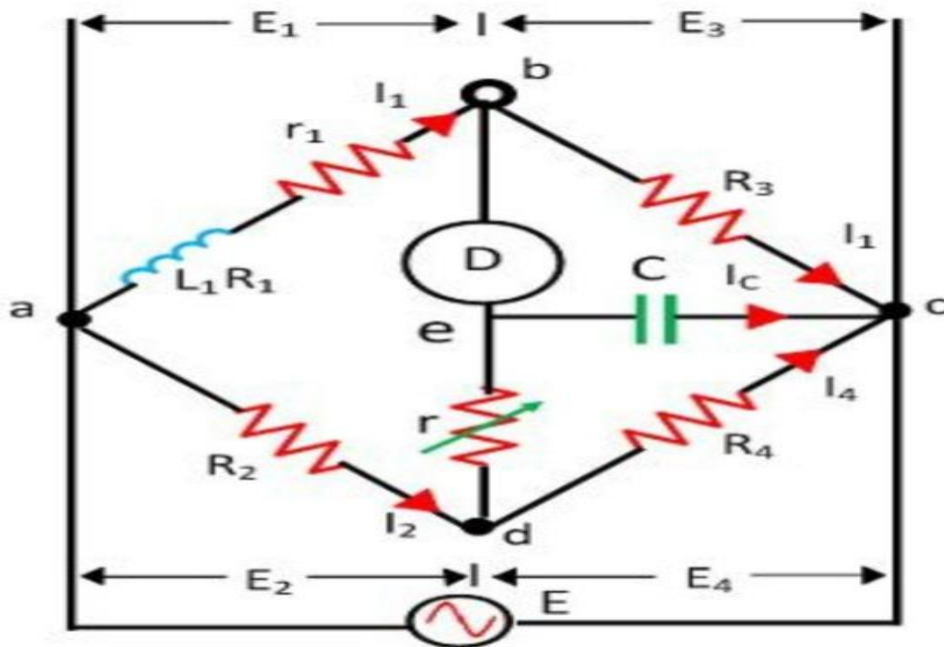
Marwari college Darbhanga

Anderson Bridge

The Anderson's bridge gives the accurate measurement of self-inductance of the circuit. The bridge is the advanced form of Maxwell's inductance capacitance bridge. In Anderson bridge, the unknown inductance is compared with the standard fixed capacitance which is connected between the two arms of the bridge.

Constructions of Anderson's Bridge

The bridge has four arms ab , bc , cd , and ad . The arm ab consists unknown inductance along with the resistance. And the other three arms consist the purely resistive arms connected in series with the circuit.



Anderson's Bridge

The static capacitor and the variable resistor are connected in series and placed in parallel with the cd arm. The voltage source is applied to the terminal a and c .

Theory of Anderson Bridge

Let, L_1 – unknown inductance having a resistance R_1 .

R_2, R_3, R_4 – known non-inductive resistance

C_4 – standard capacitor.

At balance Condition, $I_1 = I_3$ and $I_2 = I_C + I_4$

$$I_1 R_3 = I_C \times \frac{1}{j\omega C}$$

Now, $I_C = I_1 \omega C R_3$

The other balance condition equation is expressed as

$$I_1(r_1 + R_1 + j\omega L_1) = I_2 R_2 + I_C r$$

$$I_C \left(r + \frac{1}{j\omega C} \right) = (I_2 - I_C) R_4$$

By substituting the value of I_C in the above equation we get,

$$I_1(r_1 + R_1 + j\omega L_1) = I_2 R_2 + I_1 j\omega C R_3 r$$

$$I_1(r_1 + R_1 + j\omega L_1 - j\omega C R_3 r) = I_2 R_2$$

and $I_1(R_3 + j\omega R_3 R_4 + j\omega C R_3 r) = I_2 R_4$

on equating the equation, we get

$$I_1(r_1 + R_1 + j\omega L_1 - j\omega C R_3 r) = I_1\left(\frac{R_1 R_2}{R_3} + \frac{j\omega C R_3 r R_2}{R_4} + j\omega C R_3 R_2\right)$$

Equating the real and the imaginary part, we get

$$R_1 = \frac{R_1 R_3}{R_4} - r_1$$

$$L_1 = C \frac{R_3}{R_4} [4(R_4 + R_2) + R_2 R_4]$$

Advantages of Anderson Bridge

The following are the advantages of the Anderson's Bridge.

1. * The balance point is easily obtained on the Anderson bridge as compared to Maxwell's inductance capacitance bridge.
2. * bridge uses fixed capacitor because of which accurate reading is obtained.
3. * The bridge measures the accurate capacitances in terms of inductances.

Disadvantages of Anderson Bridge

The main disadvantages of Anderson's bridge are as follow.

1. * The circuit has more arms which make it more complex as compared to Maxwell's bridge. The equation of the bridge is also more complex.

2. * The bridge has an additional junction which arises the difficulty in shielding the bridge.