Degree-II, Paper-IV Group-B,
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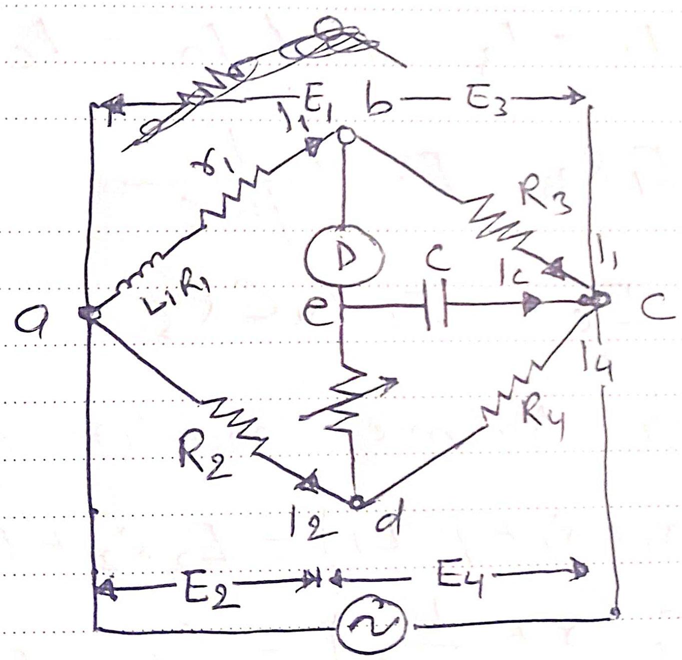
Topic :- Anderson's Bridge :

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.



Construction 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 other three arms consist the

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purely resistive arms connected in series with the circuit.

Theory of Anderson Bridge:-

Let L_1 - unknown inductance having a resistance R_1. R_2, R_3 and R_4 - Known non-inductive resistance C_4 - standard Capacitor

At balance condition

$$I_1 = I_3 \text{ and } I_2 = I_c + I_4$$

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

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$$I_c = I_1 \omega C R_3$$

The other balance condition equ

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

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

By Substituting the value of I_c in the above equ.

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

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

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

on equating the equation we get

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

Now $\boxed{R_1 = \frac{R_1 \cdot R_3}{R_4} - r_1}$

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