EXPERIMENT # 10

TO MEASURE THE UNKNOWN INDUCTANCE BY MAXWELL WEIN BRIDGE

OBJECTIVE:

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THEORY:

A **Maxwell Wien Bridge** is a modification to a Wheatstone bridge used to measure an unknown inductance (usually of low Q value) in terms of calibrated resistance and capacitance.

It uses the principle that the positive phase angle of inductive impedance can be compensated by the negative phase angle of capacitive impedance when put in the opposite arm and the circuit is at resonance; i.e., no potential difference across the detector and hence no current flowing through it. The unknown inductance then becomes known in terms of this capacitance.

L_3 can then be calculated based on the values of the other components:

$$\frac{1}{Z_1} = \frac{1}{R_1} + \frac{1}{-jX_C} = \frac{1}{R_1} + \frac{j}{X_C} = \frac{1}{R_1} + j\omega C = \frac{1 + j\omega C R_1}{R_1}$$

$$\therefore \quad Z_1 = \frac{R_1}{1 + j\omega C R_1}; \; Z_2 = R_2$$

$$Z_3 = R_3 + j\omega L_3 \text{ and } Z_4 = R_4$$

Balance condition is $Z_1 Z_3 = Z_2 Z_4$

or $$\frac{R_1(R_3 + j\omega L_3)}{1 + j\omega C R_1} = R_2 R_4 \text{ or } R_1 R_3 + j\omega L_3 R_1 = R_2 R_4 + j\omega C R_1 R_2 R_4$$

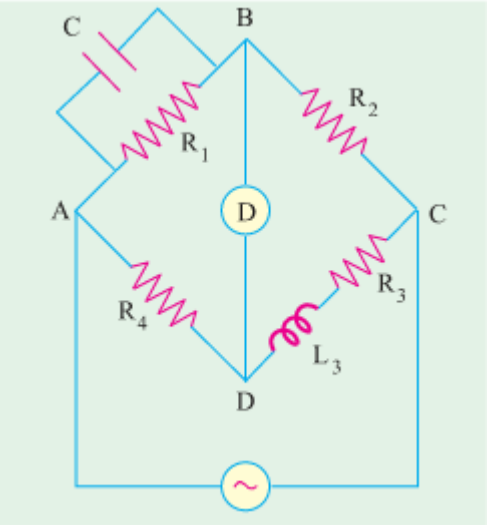
Separating the real and imaginaries, we get

$$R_1 R_3 = R_2 R_4$$

$$R_3 = \frac{R_2 R_4}{R_1}$$

$$L_3 = C R_2 R_4$$

CIRCUIT DIAGRAM:



MAXWELL WEIN BRIDGE

APPARATUS:

PROCEDURE:

OBSERVATIONS AND CALCULATIONS:

C	R_2 or R_4	R_3	L_3

Table 11.1

CONCLUSION:

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