EXPERIMENT # 10

TO MEASURE THE UNKNOWN RESISTANCE BY MAXWELL INDUCTANCE BRIDGE

OBJECTIVE:

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THEORY:

A **Maxwell Inductance Bridge** is a modification to a Wheatstone bridge used to measure an unknown inductance (usually of low Q value) in terms of calibrated resistance.
In the two arms, there are two pure resistances so that for balance relations, the phase balance depends on the remaining two arms. If a coil of unknown impedance Z1 is placed in one arm, then its positive phase angle φ1can be compensated in a way that known impedance with an equal positive phase angle may be used in either of the adjacent arms remaining two arms have zero phase angles (being pure resistances). Such a network is known as Maxwell's A.C Bridge or L1/L4 Bridge. Thus, inductive impedance may be measured in terms of another inductive impedance (of equal time constant) in either adjacent arm.

As shown in circuit diagram;

$Z_1 = R_1 + jX_1 = R_1 + j\omega L_1$ ... unknown; $Z_4 = R_4 + jX_4 = R_4 + j\omega L_4$ ...known

$R_2, R_3 =$ known pure resistances; $D =$ detector

The inductance L4 is a variable self-inductance of constant resistance, its inductance being of the same order as L1. The bridge is balanced by varying L4 and one of the resistances R2 or R3

To find the resistance;

The balance condition is that $Z_1 Z_3 = Z_2 Z_4$

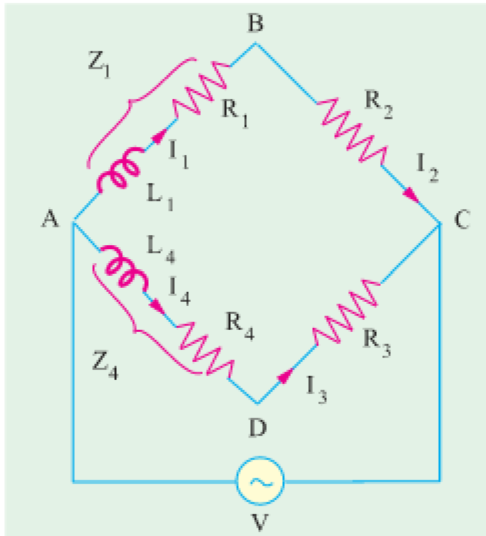
$\therefore \ (R_1 + j\omega L_1)R_3 = (R_4 + j\omega L_4)R_2$

Equating the real and imaginary parts on both sides, we have

$R_1 R_3 = R_2 R_4$ or $R_1 / R_4 = R_2 / R_3$

(*i.e.* products of the resistances of opposite arms are equal).

CIRCUIT DIAGRAM:



MAXWELL INDUCTANCE BRIDGE

APPARATUS:

PROCEDURE:

OBSERVATIONS AND CALCULATIONS:

R_1	R_2	R_3	R_4

Table 10.1

CONCLUSION:

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