SNS COLLEGE OF TECHNOLOGY

An Autonomous Institution

Coimbatore-35

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

IIYEAR/ III SEMESTER

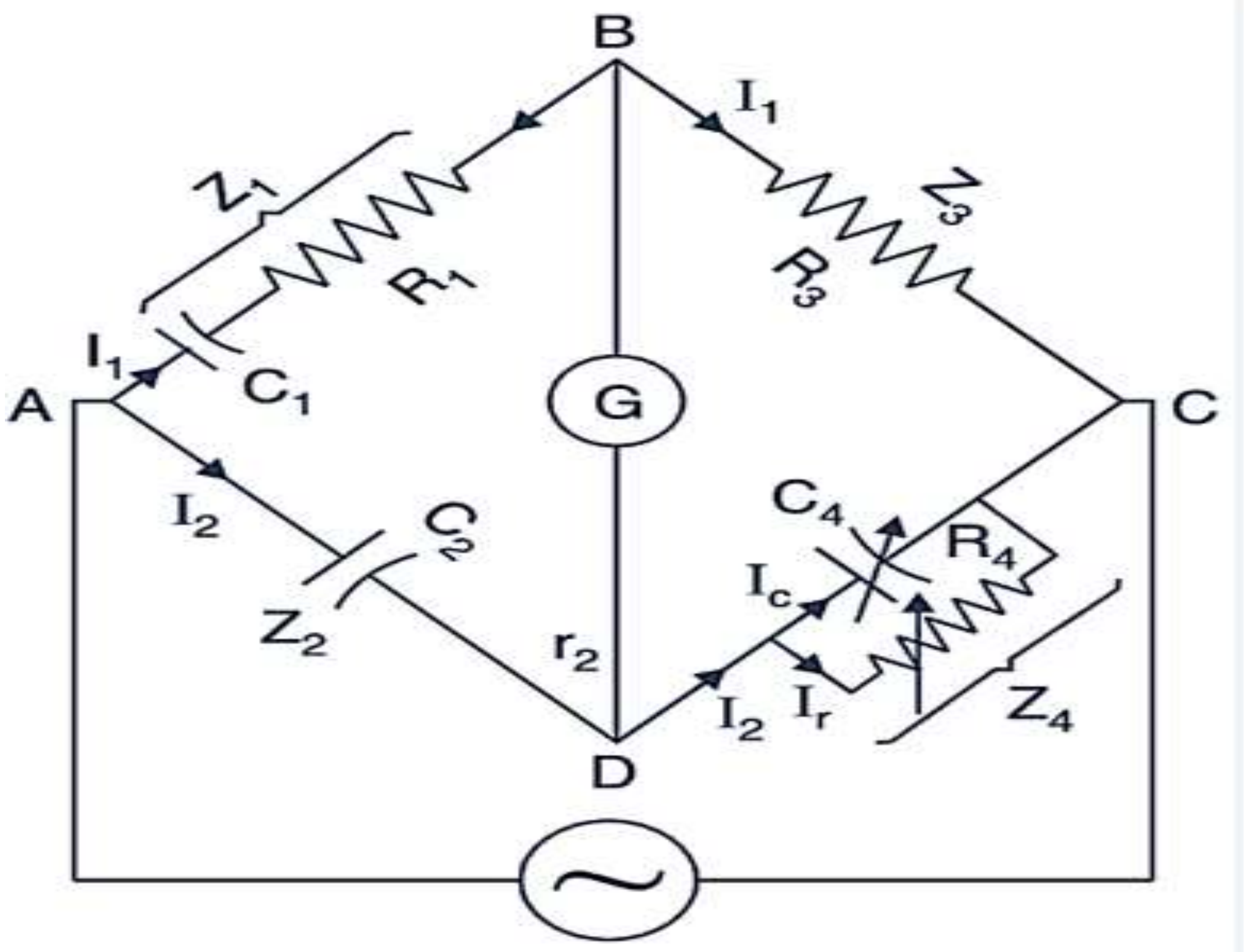
19ECT201 Electrical Engineering and Instrumentation

unit 5-MEASUREMENT SYSTEMS

,SCHERING'S BRIDGE

SCHERING 'S BRIDGE

A **Schering Bridge** is a bridge circuit used for measuring an unknown electrical capacitance and its dissipation factor. The dissipation factor of a capacitor is the the ratio of its resistance to its capacitive reactance. The Schering Bridge is basically a four-arm alternating-current (AC) bridge circuit whose measurement depends on balancing the loads on its arms



The components of the circuit are:

C_1 = The unknown capacitor

R_1 = A series resistance representing dielectric loss in the capacitor C_1

Recall that power loss in an ideal capacitor is zero. This is the resistance contained in the capacitor, which causes power loss called dielectric loss.

R_3 = a non-inductive resistor

R_4 = a variable non-inductive resistor

C_2 = a standard capacitor, is an air capacitor and is loss free

C_4 = a variable capacitor parallel with R_4

The balance is obtained by varying R_3 (or R_4).

At balance condition:

$$Z_1 Z_4 = Z_2 Z_3$$

or

$$\left[R_1 + \frac{1}{j\omega C_1}\right]\left[\frac{R_4}{1+j\omega C_4 R_4}\right] = \left[\frac{1}{j\omega C_2}\right] R_3$$

or

$$\left[R_1 + \frac{1}{j\omega C_1}\right] R_4 = \frac{R_3}{j\omega C_2}(1+j\omega C_4 R_4)$$

or

$$R_1R_4 + \frac{1}{j\omega C_1}R_4 = \frac{R_3}{j\omega C_2} + \frac{j\omega C_4R_4R_3}{j\omega C_2} \,..\,(1)$$

Since,

$$\left(\frac{1}{j} = -j\right)$$

Thus, Equation 1 written as

$$R_1R_4 - \frac{jR_4}{\omega C_1} = -\frac{jR_3}{j\omega C_2} + \frac{C_4R_4R_3}{C_2}$$

Now equating real terms

$$R_1 R_4 = \frac{C_4 R_4 R_3}{C_2}$$

or

$$R_1 = \frac{R_3 C_4}{C_2}$$

Equating imaginary terms

$$-\frac{jR_4}{\omega C_1} = -\frac{jR_3}{\omega C_2}$$

or

$$C_1 = \frac{R_4 C_2}{R_3}$$

Dissipation factor (D) is given by

$$D = \omega r_1 C_1 = \omega \times \frac{R_3 C_4}{C_2} \times C_2 \frac{R_4}{R_3}$$

$$D = \omega C_4 R_4$$

ADVANTAGES

1.Balance equations are free from frequency.

2.The arrangement of the bridge is less costly as compared to the other bridges.

DRAWBACKS

There is a difficulty in obtaining balance as R_3 appears in both equations.

APPLICATIONS

Some of the applications of using Schering bridge are

Schering bridges used by generators

Used by power engines

Used in house industrial networks, etc