

Chapter 6: Alternating Current Bridges

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Electrical Instrumentation



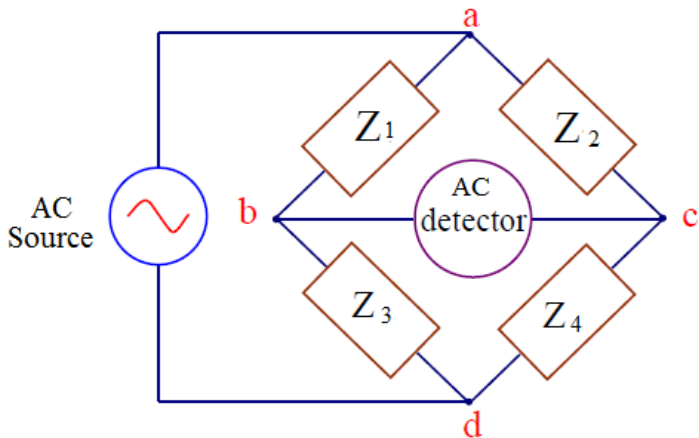
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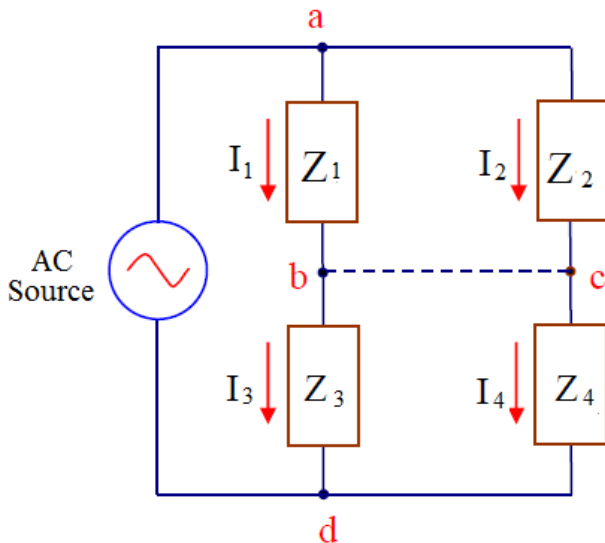
- 1 AC Bridge Circuit
- 2 Similar-Angle Bridge
- 3 Maxwell Bridge

1. AC Bridge Circuit

- AC bridges are used to measure inductance and capacitance.
- All AC bridges circuits are based on the Wheatstone bridges.

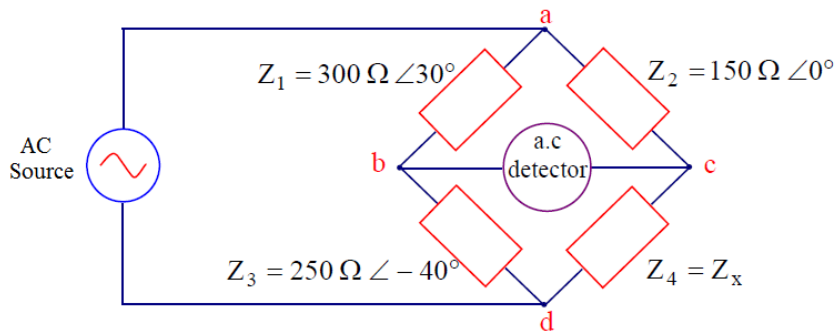


AC Bridge Circuit



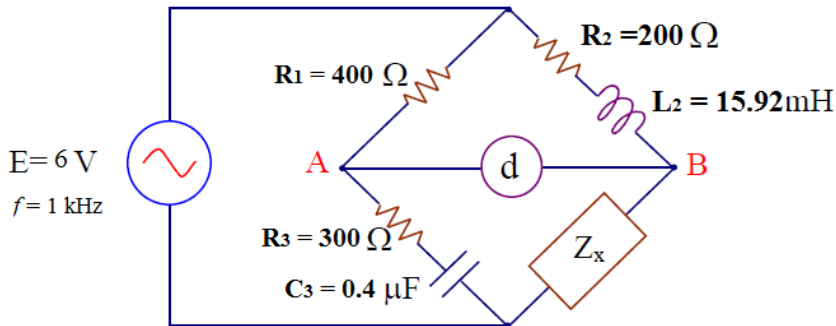
Example 1

The impedance of the AC bridge are given as shown in the Figure. Determine the value of the unknown arm.



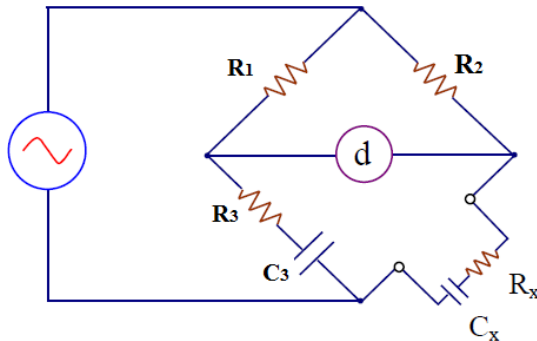
Example 2

Given the AC bridge of the Figure in balance, find the components of the unknown arm Z_x



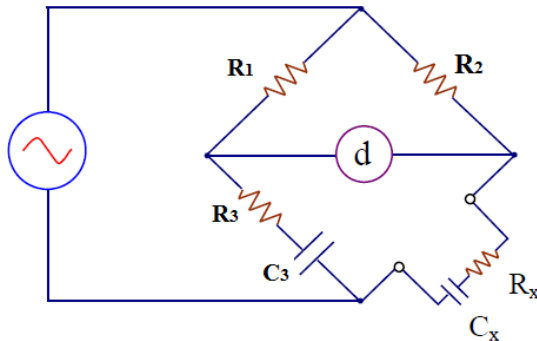
2. Similar-Angle Bridge

- The Similar-Angle Bridge is used to measure the impedance of a capacitive circuit.
- The bridge is sometimes called the capacitance comparison bridge of the series resistance capacitance bridge.



Similar-Angle Bridge

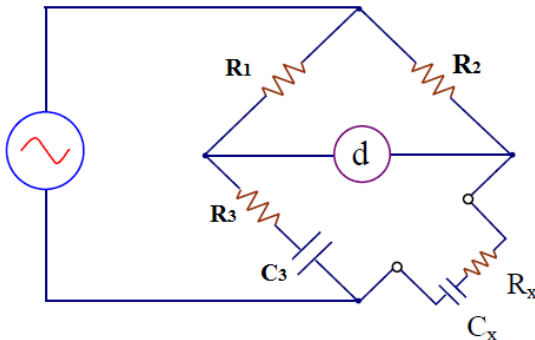
- The Similar-Angle Bridge is not dependent on either the magnitude or the frequency of the applied voltage.
- The unknown resistance and capacitance obtained are referred to as the **equivalent-series resistance** and the **equivalent-series capacitance**.



Example 3

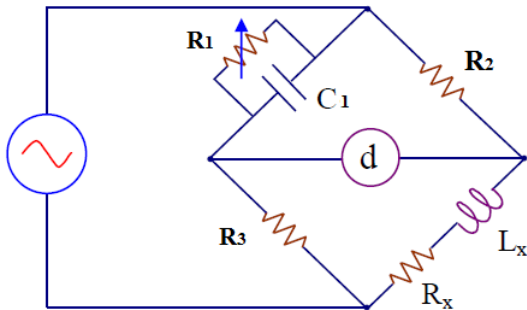
A similar angle bridge is used to measure a capacitive impedance at a frequency of 2 kHz. The bridge constants at balance are $C_3 = 100 \mu\text{F}$, $R_1 = 10\text{ k}\Omega$, $R_2 = 50\text{ k}\Omega$, $R_3 = 100\text{ k}\Omega$.

Find the equivalent-series circuit of the unknown impedance.



3. Maxwell Bridge

- It is possible to determine an unknown inductance with capacitance standard.



Example 4

A Maxwell bridge is used to measure an inductive impedance. The bridge constants at balance are $C_1 = 0.01 \mu\text{F}$, $R_1 = 470\text{ k}\Omega$, $R_2 = 5.1\text{ k}\Omega$, $R_3 = 100\text{ k}\Omega$.

Find the series-equivalent resistance and inductance.

