SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution

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

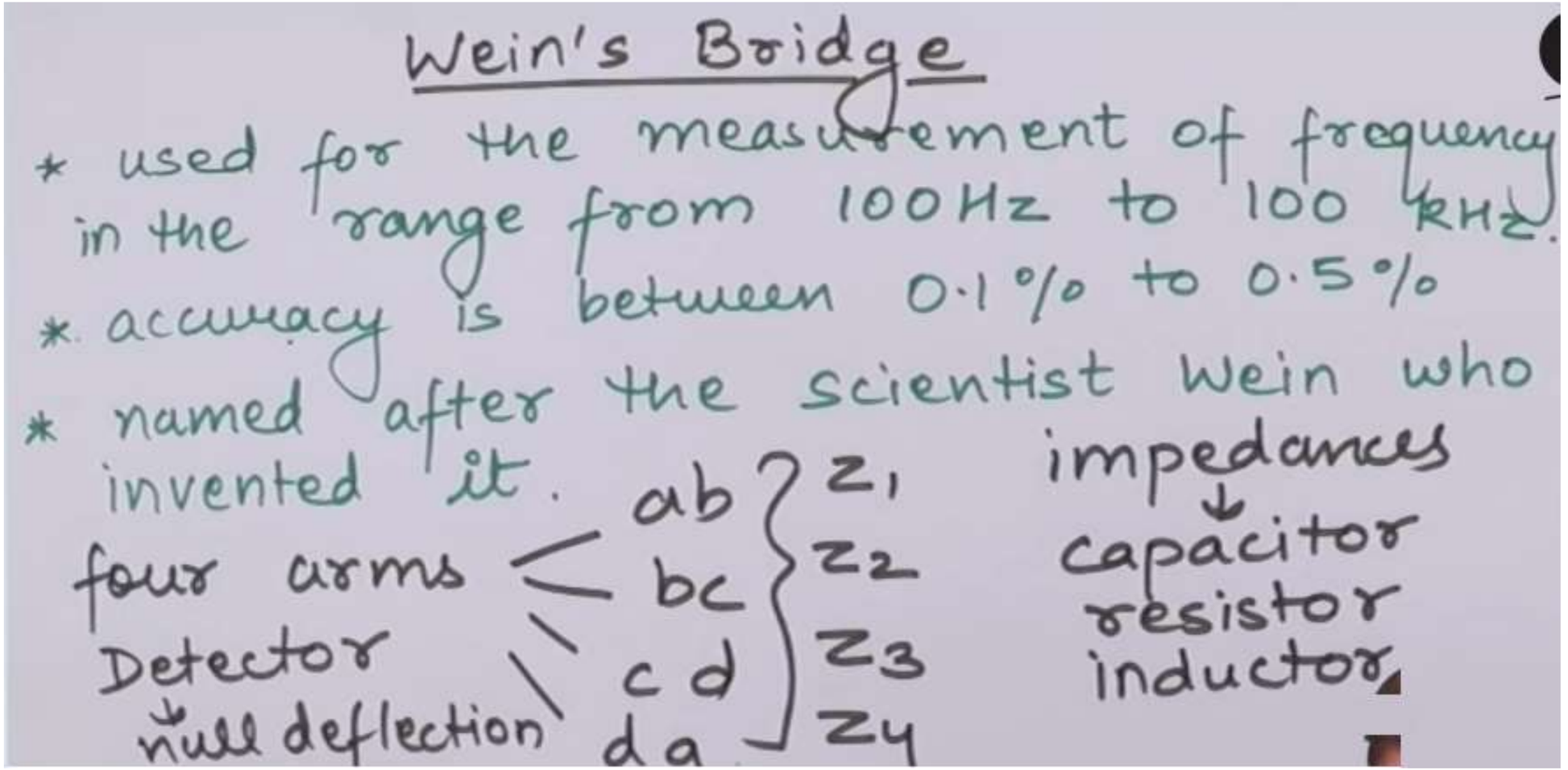
19ECT201 – ELECTRICAL ENGINEERING & INSTRUMENTATION

II YEAR/ III SEMESTER

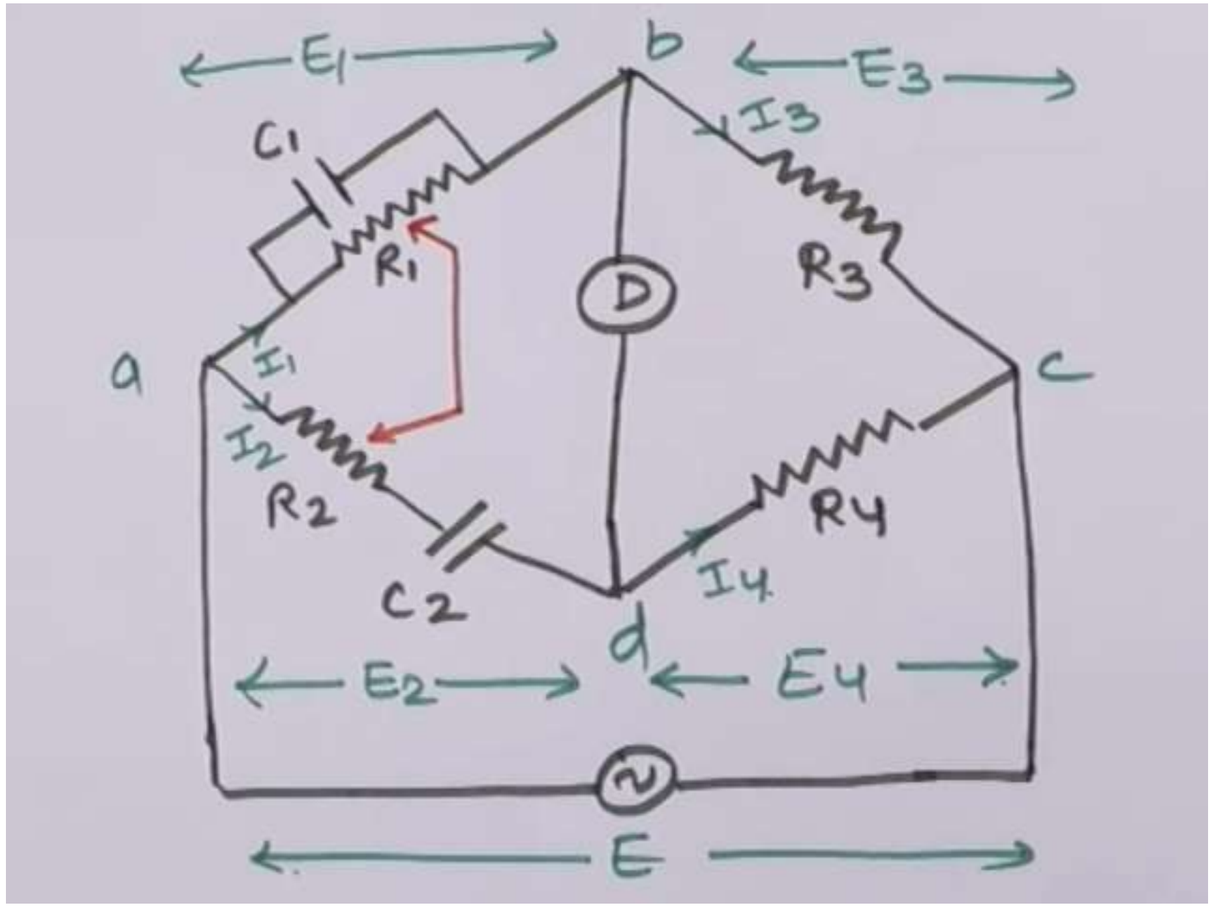
UNIT V – **MEASURING INSTRUMENTS**

WIENS BRIDGE

WIENS BRIDGE



WIENS BRIDGE



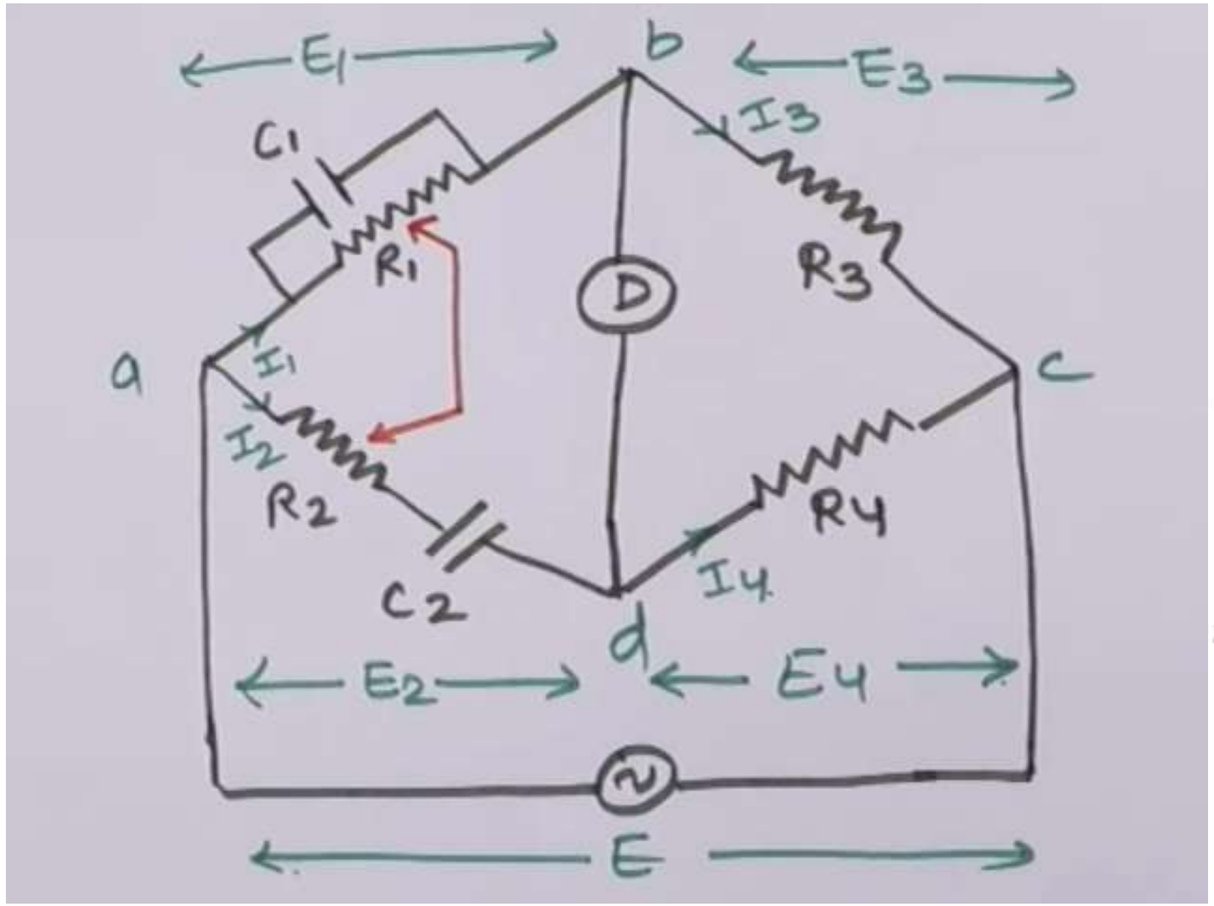
$$Z_1 = R_1 \| C_1$$

$$= \frac{\frac{R_1}{j\omega C_1}}{R_1 + \frac{1}{j\omega C_1}}$$

$$= \frac{\frac{R_1}{j\omega C_1}}{\frac{j\omega C_1 R_1 + 1}{j\omega C_1}}$$

$$\boxed{Z_1 = \frac{R_1}{1 + j\omega C_1 R_1}}$$

WIENS BRIDGE



$$Z_2 = R_2 + \frac{1}{j\omega C_2}$$

$$Z_3 = R_3$$

$$Z_4 = R_4$$

WIENS BRIDGE

BRIDGE BALANCE CONDITION

$$Z_1 Z_4 = Z_2 Z_3$$

$$\frac{R_1}{1+j\omega R_1 C_1} \times R_4 = \left[R_2 + \frac{1}{j\omega C_2}\right] \times R_3$$

$$\frac{R_4}{R_3} = \left[R_2 + \frac{1}{j\omega C_2}\right]\left[\frac{1+j\omega R_1 C_1}{R_1}\right]$$

$$\frac{R_4}{R_3} = \left[\frac{j\omega R_2 C_2 + 1}{j\omega C_2}\right]\left[\frac{1+j\omega R_1 C_1}{R_1}\right]$$

$$\frac{R_4}{R_3} = \left[\frac{1+j\omega R_2 C_2}{j\omega C_2}\right]\left[\frac{1+j\omega R_1 C_1}{R_1}\right]$$

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$$\frac{R_4}{R_3} = \frac{1 + j\omega R_2 C_2 + j\omega R_1 C_1 + j^2\omega^2 R_1 C_1 R_2 C_2}{j\omega R_1 C_2}$$

$$\frac{R_4}{R_3} = \frac{1}{j\omega R_1 C_2} + \frac{j\omega R_2 C_2}{j\omega R_1 C_2} + \frac{j\omega R_1 C_1}{j\omega R_1 C_2} + \frac{j^2\omega^2 R_1 C_1 R_2 C_2}{j\omega R_1 C_2}$$

$$\frac{R_4}{R_3} = \frac{1}{j\omega R_1 C_2} + \frac{R_2}{R_1} + \frac{C_1}{C_2} + j\omega C_1 R_2$$

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Equating Real Part

$$\frac{R_4}{R_3} = \frac{R_2}{R_1} + \frac{C_1}{C_2}$$

Equating imaginary part

$$\otimes \Theta = \frac{1}{j\omega R_1 C_2} + j\omega C_1 R_2$$

$$\Theta = \frac{1 + j^2\omega^2 R_1 C_1 R_2 C_2}{j\omega R_1 C_2}$$

$$1 + j^2\omega^2 R_1 C_1 R_2 C_2 = 0$$

$$\omega^2 R_1 C_1 R_2 C_2 = 1$$

$$\omega^2 = \frac{1}{R_1 C_1 R_2 C_2}$$

$$\omega = \frac{1}{\sqrt{R_1 C_1 R_2 C_2}}$$

$$2\pi f = \frac{1}{\sqrt{R_1 C_1 R_2 C_2}}$$

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$$R_1 = R_2 = R$$

$$C_1 = C_2 = C$$

$$2\pi f = \frac{1}{\sqrt{R_1 C_1 R_2 C_2}}$$

$$f = \frac{1}{2\pi\sqrt{R_1 C_1 R_2 C_2}}$$

$$F = \frac{1}{2\pi RC} \quad \text{Hz}$$

Thank You