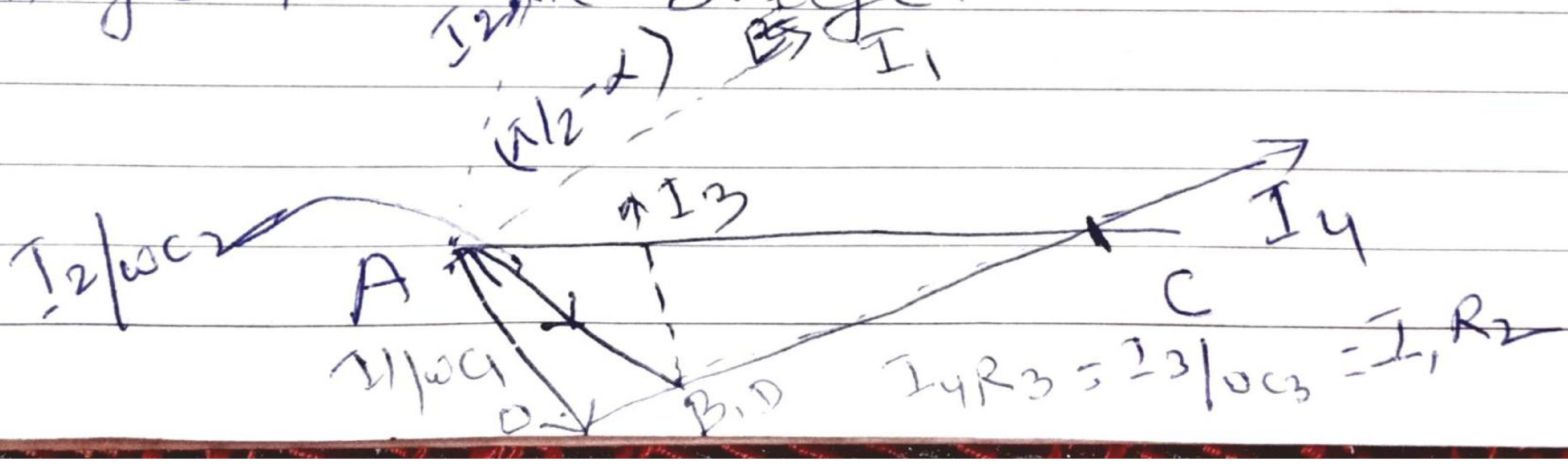
Phone.

Vector diagram of the shearing bridge

let AC represent the a/c voltage to the bridge.



SUNDAY 2
2017

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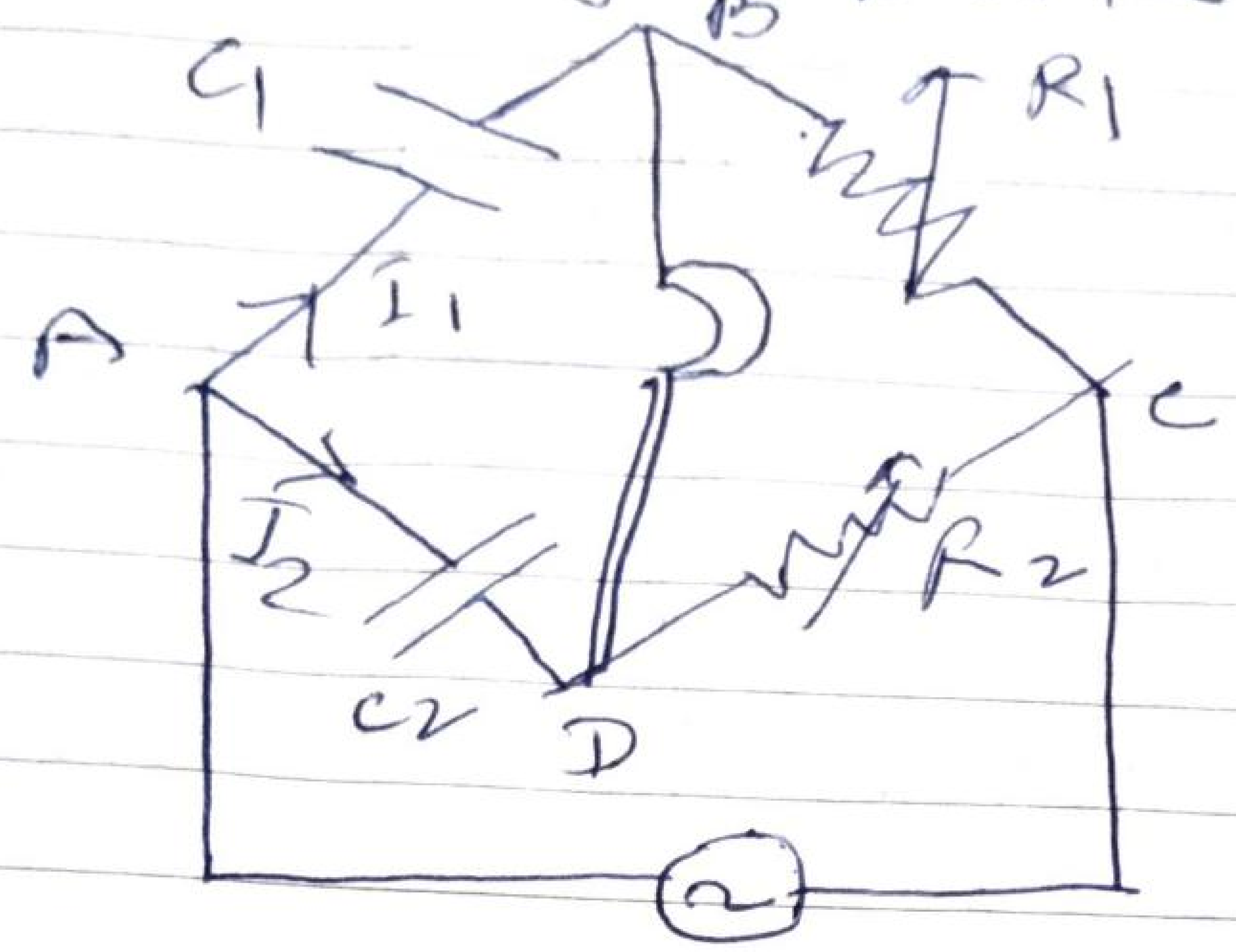
The branch ABC is capacitive so the current I_1 leads the applied voltage. Draw line AE at some angle above AC at A. This is then the direction of the branch current I_1. The Pd across C_1 is $I_1/\omega C_1$ and is at right angle to I_1, so draw a line perpendicular to AE in the clockwise direction. Cut off a length $AO = I_1/\omega C_1$. Join O with C. Then OC represents the total voltage across r_1 and R_2 since the current and voltage across a resistance are in the same phase. OC parallel to AE. Cut off a length $OB = r_1 I_1$. OB represents the voltage across r_1 and BC represents the voltage across R_2. Since B and D are at the same potential and so D also lies at B in the vector diagram. Join A with B. Then AB is the total voltage across the capacitor C_1 and its innate resistance r_1. Let I_2 be the current through C_2 and I_4 be the current through R_3. Then $DC = I_4 R_3 = \frac{I_3}{\omega C_3}$. Since current leads the emf in a capacitor, I_3 is perpendicular to BC or DC in the anticlockwise direction.

Power factor of $C_1 = \cos\alpha = OB/AD$

De Sauty's bridge →



In this bridge AB arm of the bridge is a perfect capacitor of ~~capacit~~ capacitance C_1, BC - arm is a pure resistance CD arm is also a pure resistance and DA arm is a capacitor of capacitance C_2

$$Z_1 = 1/j\omega C_1 \qquad Z_2 = R_1$$

$$Z_3 = 1/j\omega C_2 \qquad Z_4 = R_4$$

Balancing condition

$$Z_1/Z_2 = Z_3/Z_4$$

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

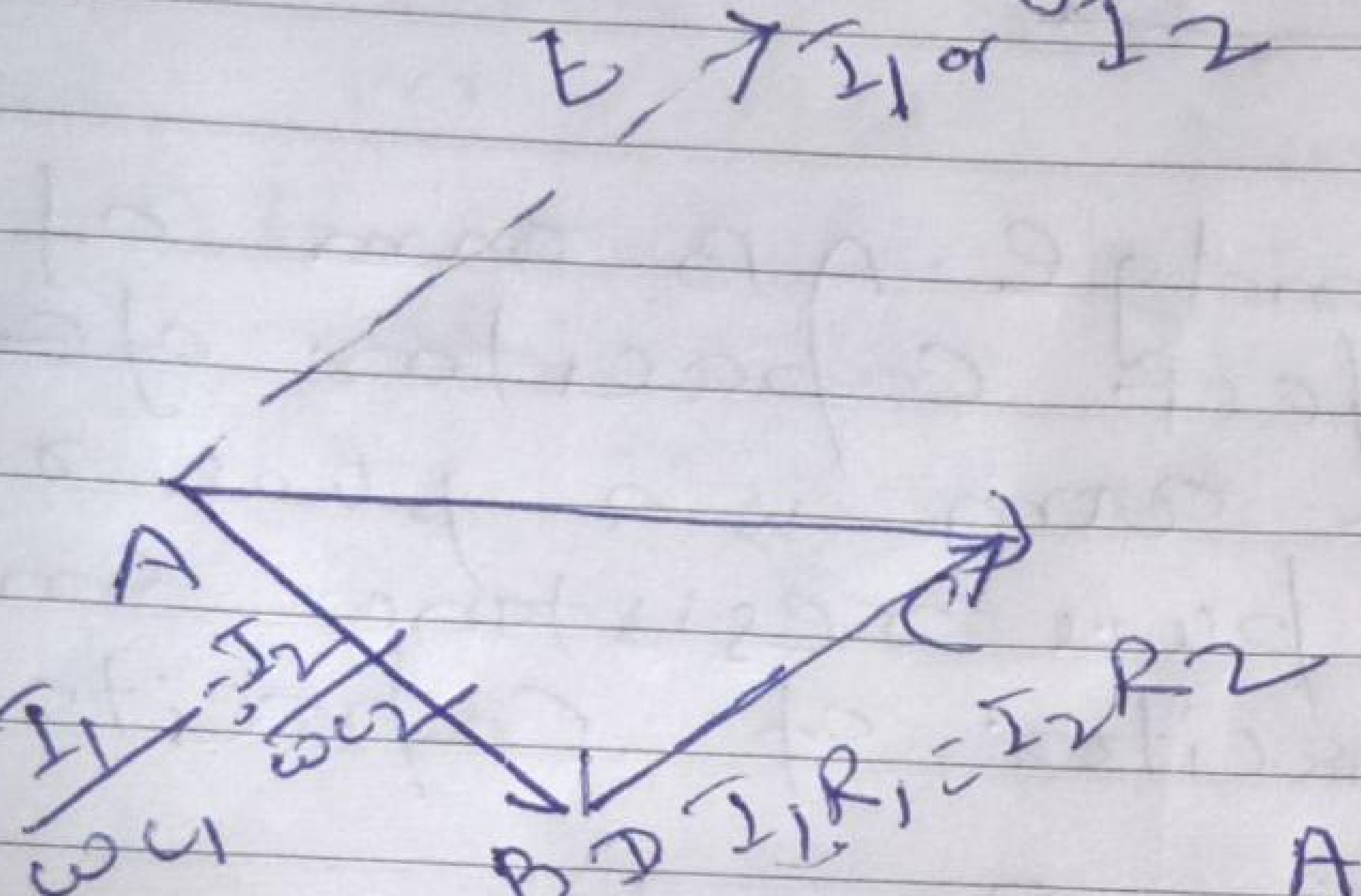
$$\frac{1}{R_1 C_1} = 1/R_2 C_2$$

$$R_1 C_1 = R_2 C_2$$

$$C_1 / C_2 = R_2 / R_1$$

This bridge is suitable for comparing two capacitances interms of two non-inductive resistances.

Vector diagram of the bridge →



AC represent the applied pd to the bridge. Since the two branches are capacitive, the currents through them lead the emf by some angle so draw a line AE at some angle above AC at A. This is then the direction of the branch current I_1. pd across $C_1 = I_1/j\omega C_1$. Draw a line perpendiculas to AE in the clockwise direction. cutoff a length $AB = I_1/j\omega C_1$ join B with C then B = pd across R_1 since in a resistor pd is in phase with the current BC must be parallel to AE. At Balance condition B & D are at the same potential.