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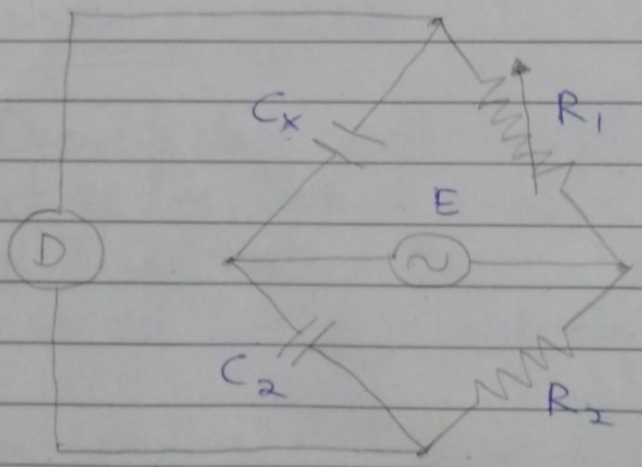
Measurement of Capacitance using Desauty's and Schering Bridge

Principle: Desauty's and Schering Bridges are useful for measuring very small value of capacitances. They are based on the principle of Wheatstone bridge.

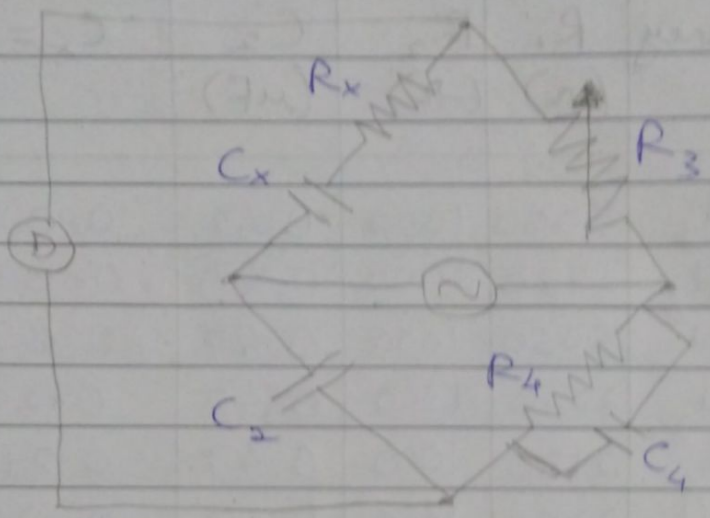
Desauty's bridge →



Desauty's bridge is a direct carry over of Wheatstone bridge with DC source replaced by AC source. The null detector used has an amplifier to adjust gain, which is used to get null point. At balanced condition unknown capacitance C_x can be calculated as

$$C_x = C_2 \frac{R_2}{R_1}$$

Schering Bridge →



Schering bridge is used to measure an unknown electrical capacitance and its dissipation factor, which is the ratio of its resistance to its capacitive reactance. At balanced condition,

$$C_x = C_2 \frac{R_4}{R_3} \quad \text{and} \quad R_x = R_3 \frac{C_4}{C_2}$$

Experiment - 1

Objective: Determination of unknown capacitance using Desauty's bridge method.

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Observation Table:

S. No.	Frequency	R_1 (Ω)	R_2 (Ω)	C_2 (μF)	$C_x = C_2 R_2 / R_1$ (μF)	
1	1 kHz	5000	1000	0.47	0.0940	C_{x_1}
2	6 kHz	4980	1000	0.47	0.0944	
3	2.5 kHz	5050	1000	0.47	0.0930	
4	1 kHz	2240	1000	0.47	0.2098	C_{x_2}
5	6 kHz	2180	1000	0.47	0.2155	
6	2.5 kHz	2250	1000	0.47	0.2088	
7	1 kHz	1100	1000	0.47	0.4272	C_{x_3}
8	6 kHz	1080	1000	0.47	0.4351	
9	2.5 kHz	1050	1000	0.47	0.4476	

Calculations:

Mean value of $C_{x_1} = \frac{0.0940 + 0.0944 + 0.0930}{3}$

$= 0.0938\ \mu F$

Mean value of $C_{x_2} = \frac{0.2098 + 0.2155 + 0.2088}{3}$

$= 0.2113\ \mu F$

Mean value of $C_{x_3} = \frac{0.4272 + 0.4351 + 0.4476}{3}$

$= 0.4366\ \mu F$

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Result : Experimentally determined values of unknown capacitances C_{x1}, C_{x2}, C_{x3} are 0.0938 μF, 0.2113 μF and 0.4366 μF respectively.

Experiment-2

Objective : Determination of unknown capacitance using Schering Bridge method

Observation Table :

S.No.	Frequency	R_3 (kΩ)	R_4 (kΩ)	C_3 (μF)	$C_x = C_3 R_4 / R_3$ (μF)	
1	1 kHz	2.01	0.47	0.47	0.109	C_{x4}
2	4 kHz	2.1	0.47	0.47	0.105	
3	8 kHz	2.04	0.47	0.47	0.108	
4	1 kHz	1.07	0.47	0.47	0.206	C_{x5}
5	4 kHz	1.09	0.47	0.47	0.202	
6	8 kHz	1.05	0.47	0.47	0.210	
7	1 kHz	0.44	0.47	0.47	0.502	C_{x6}
8	4 kHz	0.48	0.47	0.47	0.460	
9	8 kHz	0.48	0.47	0.47	0.460	

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Calculations:

Mean value of $C_{x4} = \frac{0.109 + 0.105 + 0.108}{3}$

$= 0.107\ \mu F$

Mean value of $C_{x5} = \frac{0.206 + 0.202 + 0.210}{3}$

$= 0.206\ \mu F$

Mean value of $C_{x6} = \frac{0.502 + 0.460 + 0.460}{3}$

$= 0.474\ \mu F$

Result: Experimentally determined values of unknown capacitances C_{x4}, C_{x5} and C_{x6} are $0.107\ \mu F$, $0.206\ \mu F$ and $0.474\ \mu F$ respectively.