



SNS COLLEGE OF TECHNOLOGY
An Autonomous Institution
Coimbatore-35



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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

IIYEAR/ III SEMESTER

19ECT201 Electrical Engineering and Instrumentation

TOPIC -MEASURING INSTRUMENTS-Q meter



Q meter



- A device that is used to measure the QF (quality factor) or storage factor or quality factor of the circuit at radio frequencies is called the Q-meter.
- The Q meter measures the quality factor of the circuit which shows the total energy dissipated by it. It also explains the properties of the coil and capacitor.



q-meter



WORKING PRINCIPLE:

The Q meter works on **series resonant**. The resonance is the condition exists in the circuit when their inductance and capacitance reactance are of equal magnitude.

At resonance $X_L = X_C$ and $E_L = I_{XL}$, $E_C = I_{XC}$, $E = I R$

Where 'E' is an applied voltage

EC' is the capacitor voltage

'EL' is an inductive voltage

'XL' is the inductive reactance

'XC' is the capacitive reactance

'R' is the coil resistance

'I' is circuit current

Thus, $Q = X_L/R = X_C/R = E_C/E$

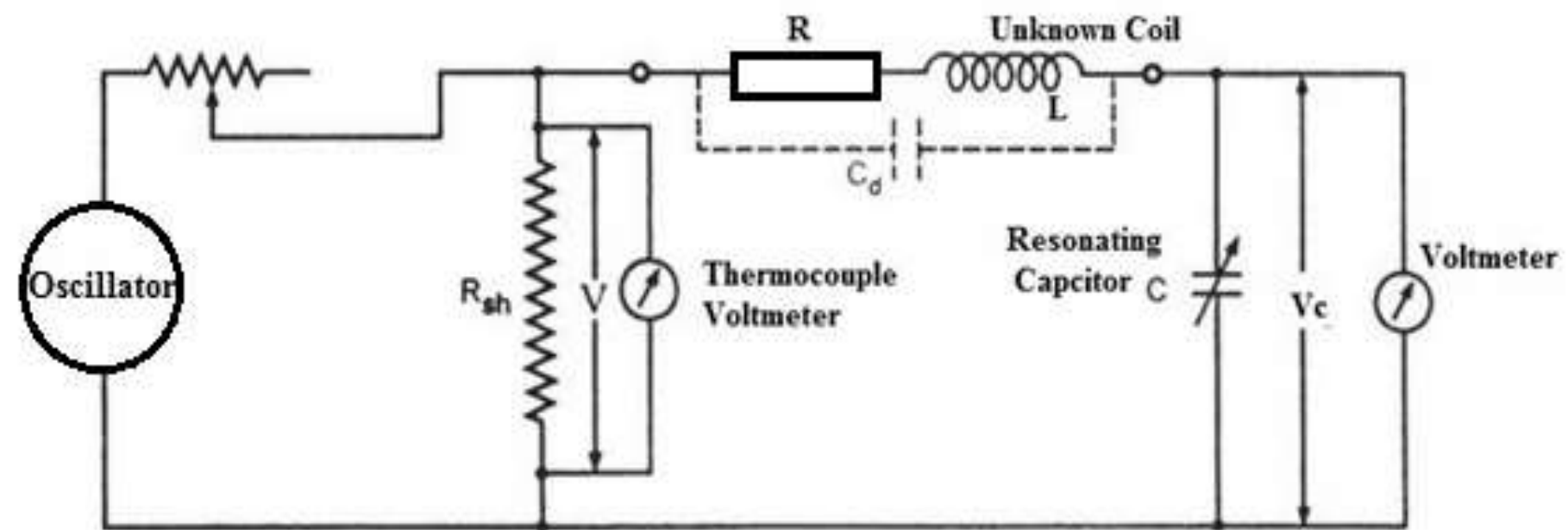
From the above 'Q' equation, if an applied voltage is kept stable so that the voltage across the capacitor can be calculated using a voltmeter to read 'Q' values directly.



Q Meter Circuit



- The circuit diagram of the 'Q' meter is shown below.
- It is designed with an oscillator that uses the frequency that ranges from 50 kHz – 50 MHz. and provides current to a shunt resistance 'R_{sh}' with 0.02 ohms value.



q-meter-circuit



In the circuit, the energy of the oscillator can be supplied to the tank circuit. This circuit can be adjusted for the resonance through unstable 'C' until the voltmeter reads the utmost value.

The o/p voltage of resonance is 'E', equivalent to 'Ec' is $E = Q \times e$ and $Q = E/e$. Because 'e' is known so the voltmeter is adjusted to read 'Q' value directly.

The coil is connected to the two test terminals of the instrument to determine the coil's inductance

This circuit is adjusted to resonance through changing either the oscillator frequency otherwise the capacitance.

The specified Q is not the definite Q, as the losses of the voltmeter, inserted resistance & resonating capacitor are all incorporated in the circuit. Here, the definite 'Q' of the calculated coil is a bit larger than the specified Q.

Applications

The applications of Q-meter include the following.

It is used to measure the quality factor of the inductor.

By using this meter, unknown impedance can be measured using a series or shunt substitution method. If the impedance is small, the former technique is used and if it is large, then the latter technique is used.

It is used to measure small capacitor values.

By using this, inductance, effective resistance, self-capacitance, and bandwidth can be measured.



THANK YOU