EXPERIMENT-4

AIM- To study the resonance effect in a series LCR circuit.

APPARATUS- Oscillator (1 to 1 MHz),resistors,capacitors,inductors,AC milli-ammeter.

PRINCIPLE USED- There is an inductor(L),capacitor (C) and resistance (R) connected in series with a source of sinusoidally varying emf $\varepsilon(t)=\varepsilon_0\cos(\omega t)$ .When we equate the voltage drop across the resistor and capacitor to the total EMF ,we get

$RI + q/C = V_L + \varepsilon_0\cos(\omega t) = -LdI/dt + \varepsilon_0\cos(\omega t)$

$I_0 = \varepsilon_0 /(R^2 + (\omega L-(1/\omega C))^2)^{1/2}$

So I_0 will be maximum when $\omega_0 = 1/(LC)^{1/2}$ this is known as resonance frequency which is the natural frequency of electromagnetic oscillations in LCR circuit without an external source of emf.

We measure RMS current with the help of an AC milli ammeter

The average power dissipated over one cycle is $P=I_{rms}^2 R$.

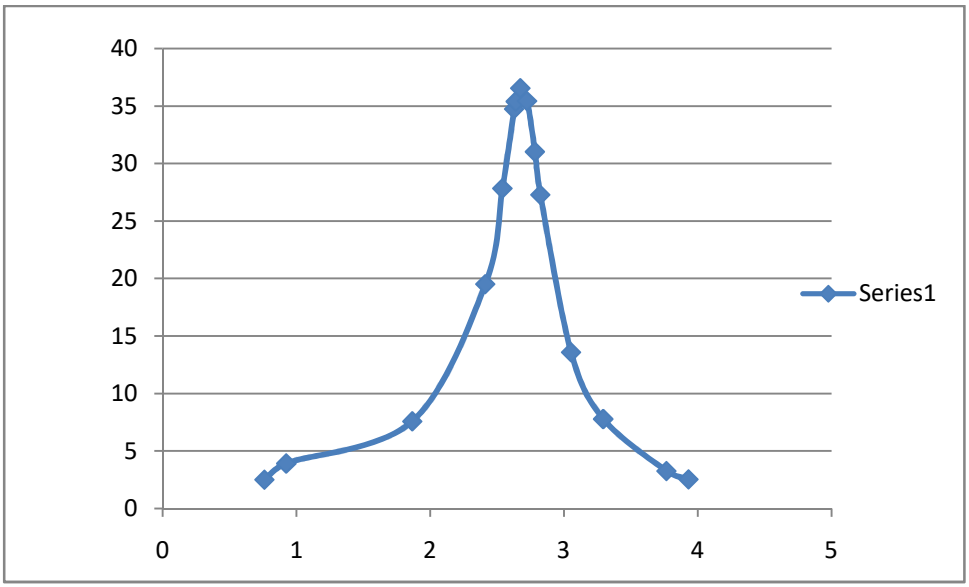
PROCEDURE- In the series LCR circuit,an inductor(L) a capacitor (C) and a resistor (R) are connected in series with a variable frequency emf source and the voltage across the resistance is measured . As the frequency is varied ,the current i the circuit changes and hence the voltage across R changes,becoming maximum at the resonance frequency .

OBSERVATION

TABLE

ω(KHz)(x-axis)	V(mV)(y-axis)
.762	2.52
.925	3.92
1.867	7.59
2.412	19.52
2.540	27.84

2.628	34.75
2.640	35.41
2.674	36.56
2.724	35.45
2.783	31.04
2.824	27.29
3.053	13.60
3.294	7.79
3.766	3.27
3.931	2.54



CONCLUSION-

So we can see from the graph that the maximum voltage which implies maximum amplitude of current occurs at a frequency of 2.674 KHz which is the resonance frequency of this system . considering in this particular observation the R=1Ω C=100 nF and L=35mH.The theroritical value of the resonance frequency shoud have been 16.903 KHz.