Questions:-

1. Explain why the load voltage in RLC circuit is maximum at resonance condition.

Ans:- Since the RLC circuit is driven by a variable frequency and $Z = R + jX_L - jX_C$, at resonance condition, $jX_L = jX_C$ resulting ($Z = R$) the circuit to be purely resistive. As the magnitude of the voltage V is directly proportional to the impedence Z, the entire source voltage acts across R. Thus the ~~load~~ load voltage is maximum at resonance condition.

2. If a 5mH inductor was used instead of 560μH one, what capacitance value would be required to keep the resonant frequency (f_o) the same as the value obtained from the experiment.

Ans: $f_o = \frac{1}{2\pi\sqrt{LC}}$

$\Rightarrow 21268 = \frac{1}{2\pi\sqrt{5\times10^{-3}\,C}}$

$\Rightarrow C = \frac{1 \times 5\times10^{-3}}{\sqrt{21268} \times 2\pi}$

$= 1.37 \times 10^{-5}\ F$

$= 0.13.7\ \mu F$

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5. Is it possible to have a resonance condition in a parallel ~~circuit~~ RLC circuit? If so, briefly discuss a possible experimental set up which could be used to investigate resonance in a parallel RLC circuit.

Ans: It is possible to have a resonance condition in a parallel RLC circuit where energy will constantly be transferred back and forth between the inductor and the capacitor resulting in zero current and energy being absorbed from the supply. The experiment setup should be similar to the series RLC component wise except the resistor, inductor and capacitor should be connected in parallel respectively to frequency generator. Change the frequency until maximum peak voltage is obtained. That will be the resonant frequency for the parallel RLC circuit.

6. Do the practical value of of the resonant frequency bandwidth and quality factor obtained from confirm with the theoretical values. If any percentage ~~is~~ difference are above 10% suggest 3 possible reasons for the discrepancy.

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3. How would the resonant frequency of the circuit given in figure B.11 change if the 100Ω resistor was replaced with a 50Ω one? explain.

Ans: No change will occur on the resonant frequency. Since resonant frequency depends wholly on the capacitance and inductance of the circuit, $f_o = \frac{1}{2\pi\sqrt{LC}}$, any change in the value of the resistor will not affect the value of the Resonant frequency. It will only affect the peak of the resonance ~~as~~ the current will in the oscilloscope as $V = IR$.

4 Use your experimental results and the graph obtained from the simulations to explain the concept of high and low Quality factors in series RLC circuits.

Ans: Quality factor is the ratio of resonant frequency to bandwidth.

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