JAYPEE INSTITUTE OF INFORMATION TECHNOLOGY
Electronics and Communication Engineering
Electrical Science-1 (15B11EC111)
Tutorial Sheet: 10

Q1. [CO3] A series resonance network consisting of a resistor of 30 Ω, a capacitor of 2 μF and an inductor of 20 mH is connected across a sinusoidal supply voltage which has a constant output of 9 V at all frequencies. Calculate the resonant frequency, the current at resonance, the voltage across the inductor and capacitor at resonance, the quality factor and bandwidth of the circuit. Also, find the upper and lower -3 dB frequency points f_H and f_L.

Q2. [CO3] A series circuit consists of a resistor of 4 Ω, an inductance of 500 mH and a variable capacitance connected across a 100 V, 50 Hz supply. Calculate the capacitance required to produce a series resonance condition and the voltage generated across both the inductor and the capacitor at the points of resonance.

Q3. [CO3] A parallel resonance network consisting of a resistor of 60 Ω, a capacitor of 120 μF and an inductor of 200 mH is connected across a sinusoidal supply voltage which has a constant output of 100 V at all frequencies. Calculate the resonant frequency, the quality factor and bandwidth of the circuit, the circuit current at resonance frequency.

Q4. [CO3] A constant voltage of frequency 1 MHz is applied to a lossy inductor (r in series with L), in series with a variable capacitor, C as shown in Fig. 5.1. The current drawn is maximum when C=400 pF, while current is reduced to (1/√2) of the above value, when C=450 pF. Find the value of r and L. Calculate the quality factor of the coil and the bandwidth.

Q5. [CO3] A coil having a resistance of 15 Ω and an inductance of 0.75 H is connected in series with a capacitor as shown in Fig. 5.2(a). The circuit draws maximum current when a voltage of 200 V at 50 Hz is applied. A second capacitor is then connected in parallel to the circuit as shown in Fig. 5.2(b).What should be its value such that the combination acts like a non-inductive resistance with same voltage 200 V at 100 Hz and calculate the currents drawn by the two circuits too.

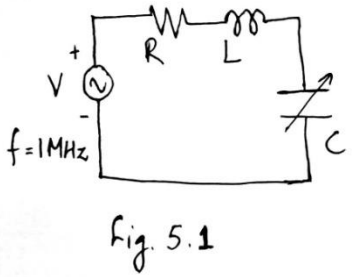
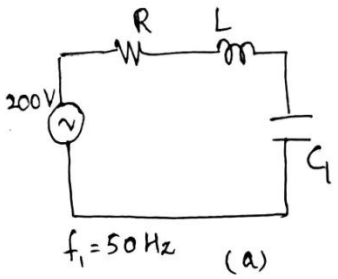


Fig. 5.1



(a)

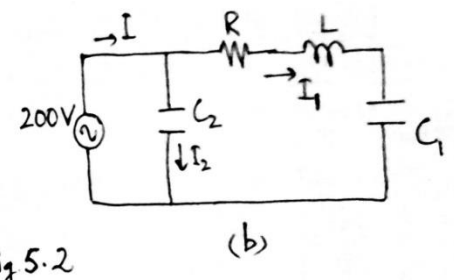


Fig 5.2 (b)