Problem Set (8)

Resonance

1. Measurements on a practical inductor at 10MHz give L = 8 mH and Qind = 40.
(a) Find the ideal capacitance C for parallel resonance at 10MHz and calculate the corresponding bandwidth β.

2. Compare the resonant frequency of the circuit shown in Fig. 1 for R = 0 to that for R = 50 ohm.

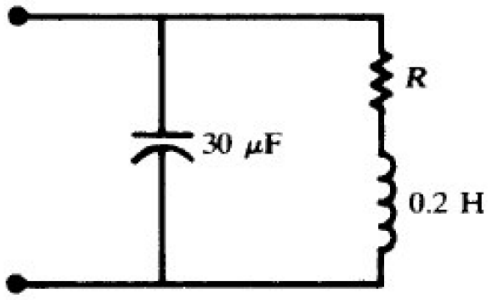

Figure 1

3. A 20-μF capacitor is in parallel with a practical inductor represented by L = 1 mHz in series with R =7 Ω. Find the resonant frequency, in rad/s and in Hz, of the parallel circuit.
"Ans: 1000 rad/s, 159.2 Hz"

4. What must be the relationship between the values of R_L and R_C if the network shown in Fig. 2 is to be resonant at all frequencies?
"Ans: RL = RC = 5 Ω."

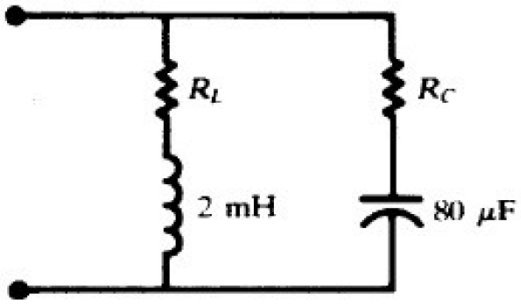

Figure 2

5. For the parallel network shown in Fig. 3, find the value of R for resonance; what is the value of X_c at resonance.

Ans. (*a*) 6.0 Ω; (*b*) $R_p = 6.67\ \Omega, X_{C_p} = 20\ \Omega$

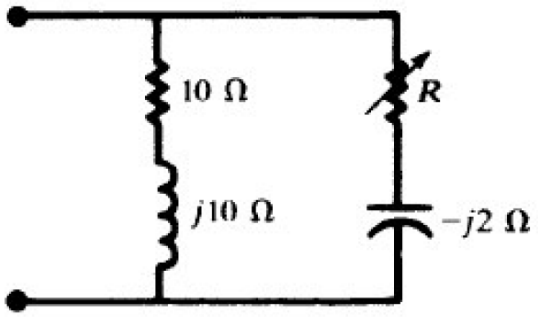

Figure 3

6. Assume that a sinusoidal voltage source with a variable frequency and V_{max} = 50 V is applied to the circuit shown in Fig. 4.

(a) At what frequency f is |I| a minimum?

(b) Calculate this minimum current.

(c) What is $|I_C|$ at this frequency?

Ans. (*a*) 2.05 kHz; (*b*) 2.78 mA; (*c*) 10.8 mA

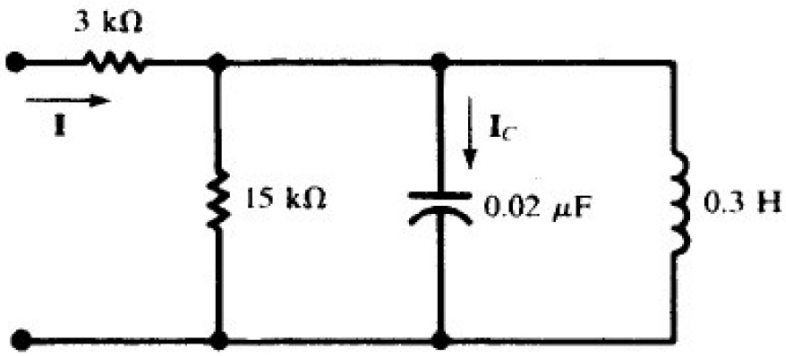

Figure 4

7. For the network of Fig. 5

a. Find the resonance frequency..

b. Calculate the magnitude of V_C at resonance.

c. Determine the power absorbed at resonance.

d. Find the BW.

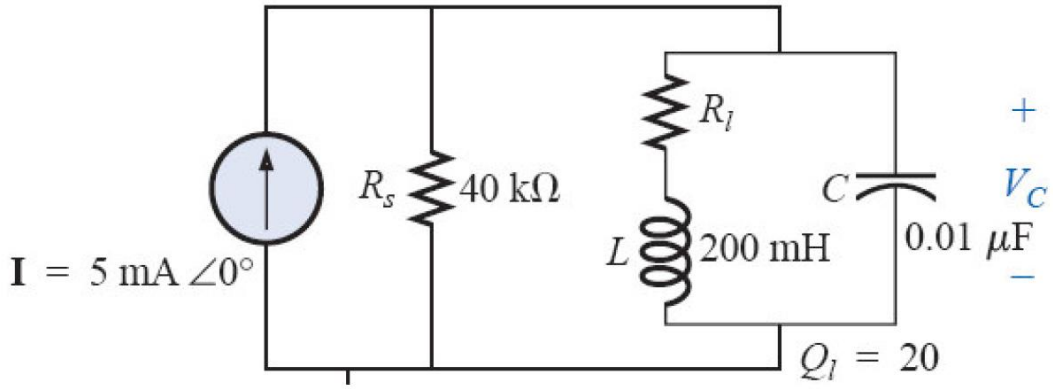

Figure 5

8. For the network of Fig. 6:

a. Find the value of XC at resonance .

b. Find the total impedance Z_{Tp} at resonance.

c. Find the currents I_L and I_C at resonance .

d. If the resonant frequency is 20,000 Hz, find the value of L and C at resonance.

e. Find the BW.

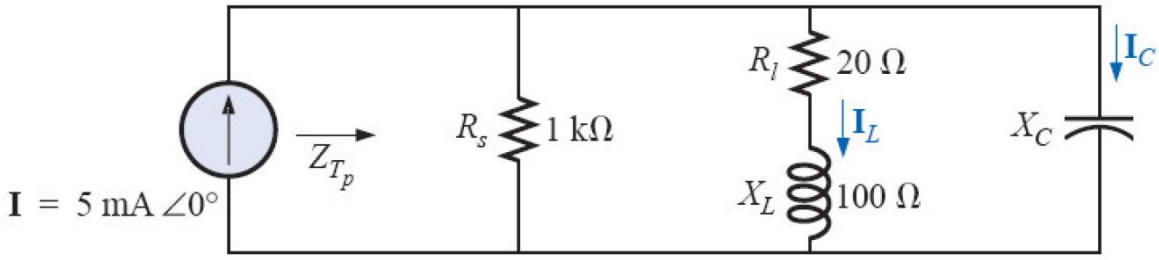

Figure 6