



Sheet (4)... Parallel Resonance

1. Consider the circuit shown in Figure 1.

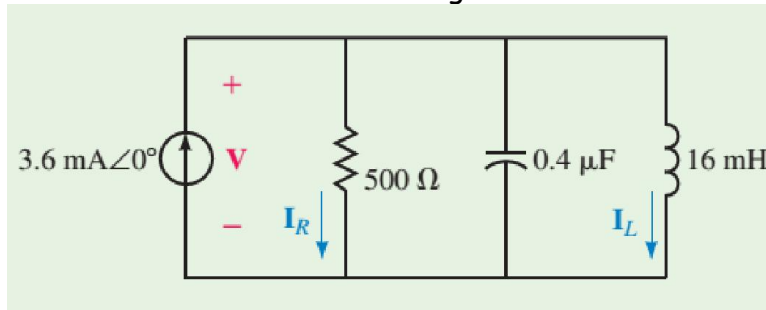


Fig. 1

- Determine the resonant frequencies, $\omega_p(\text{rad/s})$ and $f_p(\text{Hz})$ of the tank circuit.
 - Find the Q of the circuit at resonance.
 - Calculate the voltage across the circuit at resonance.
 - Solve for currents through the inductor and the resistor at resonance.
 - Determine the bandwidth of the circuit in both radians per second and hertz.
 - Sketch the voltage response of the circuit, showing the voltage at the half-power frequencies.
 - Sketch the selectivity curve of the circuit showing $P(\text{watts})$ versus $\omega(\text{rad/s})$.
2. Consider the circuit of Figure 2.

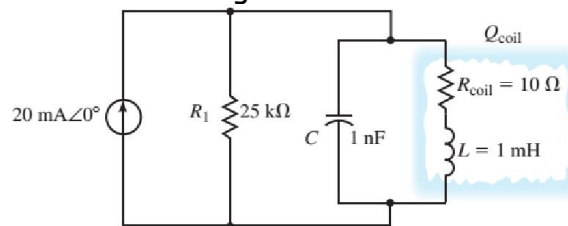


Fig. 2

- Calculate the resonant frequency, ω_p , of the tank circuit.
- Find the Q of the coil at resonance.
- Sketch the equivalent parallel circuit.
- Determine the Q of the entire circuit at resonance.
- Solve for the voltage across the capacitor at resonance.

Good Luck



3. Determine the values of R_1 and C for the resonant tank circuit of Figure 3 so that the given conditions are met.
 $L = 10 \text{ mH}$, $R_{\text{coil}} = 30 \Omega$, $f_p = 58 \text{ kHz}$, $BW = 1 \text{ kHz}$
 Solve for the current, I_L , through the inductor.

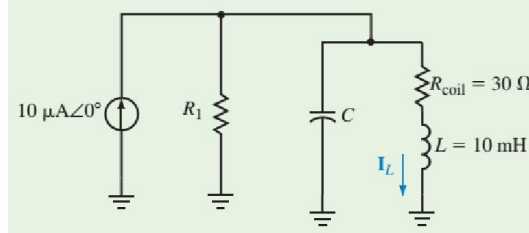


Fig. 3

4. Let $V_s = 20 \cos(\omega t) \text{ V}$ in the circuit of Fig. 4. Find ω_0 , Q , and B , as seen by the capacitor.

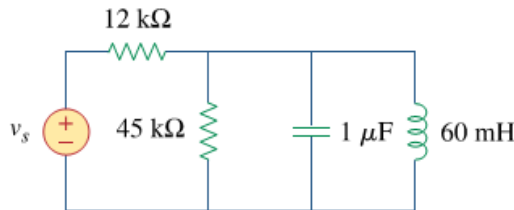


Fig. 4

5. Design a parallel resonant RLC circuit with $\omega_0 = 10 \text{ rad/s}$ and $Q = 20$. Calculate the bandwidth of the circuit. Let $R = 10 \Omega$.
6. It is expected that a parallel RLC resonant circuit has a mid-band admittance of $25 \times 10^{-3} \text{ S}$, quality factor of 80, and a resonant frequency of 200 krad/s . Calculate the values of R , L , and C . Find the bandwidth and the half-power frequencies.
7. For the "tank" circuit in Fig. 5, find the resonant frequency.

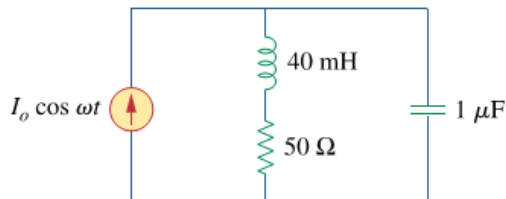


Fig. 5

Good Luck