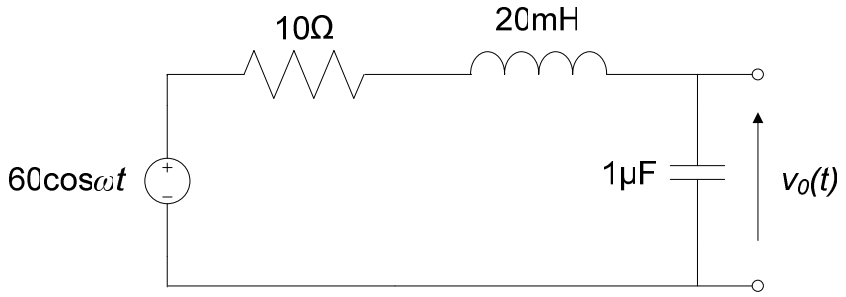
Problem Set 9 (Fall 2008)

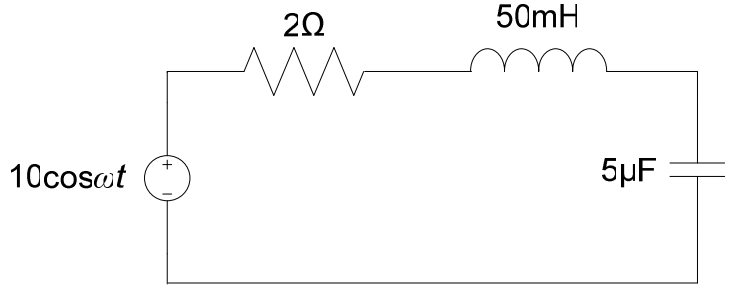
Resonance:

9.1 Given the network below find ω_0, $|V_0(\omega_0)|$ and Q.

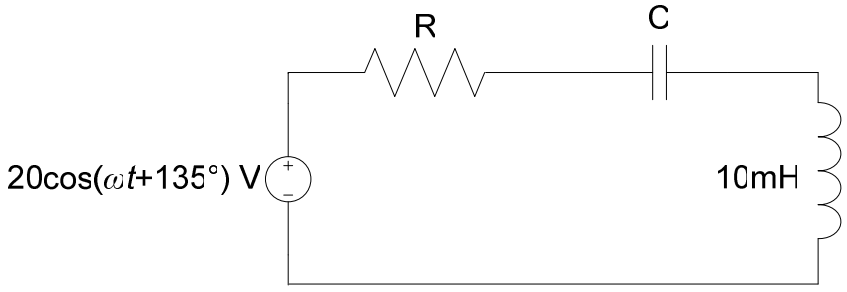


9.2 Repeat Problem 9.1 if the value of *R* is changed to 1Ω.

9.3 Determine the resonant frequency, *Q*, BW, and the average power dissipated by the network at resonance.

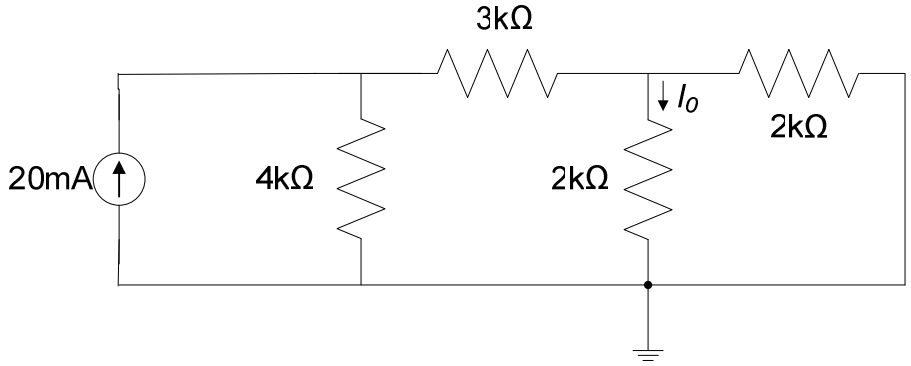


9.4 In the circuit below, if the magnitude of the current at resonance is 10A, ω_0=1000 rad/sec, find C, Q, and the bandwidth of the circuit.

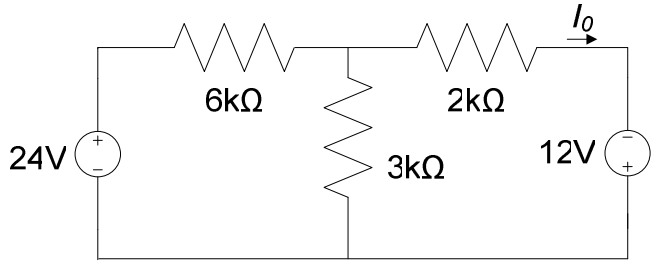


Nodal Anaylsis:

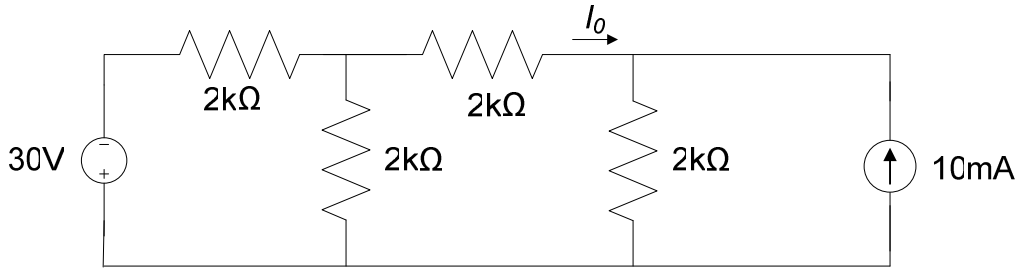
9.5 Find I_0 in the circuit below using nodal analysis.



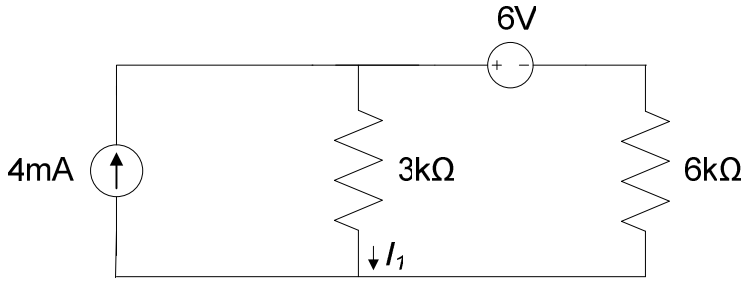
9.6 Find I_0 in the circuit below using nodal analysis.



9.7 Find I_0 in the circuit below using nodal analysis.

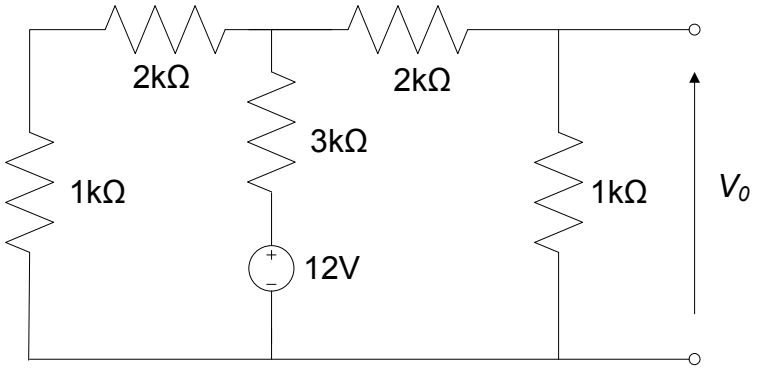


9.8 Find I_1 in the circuit below using nodal analysis.

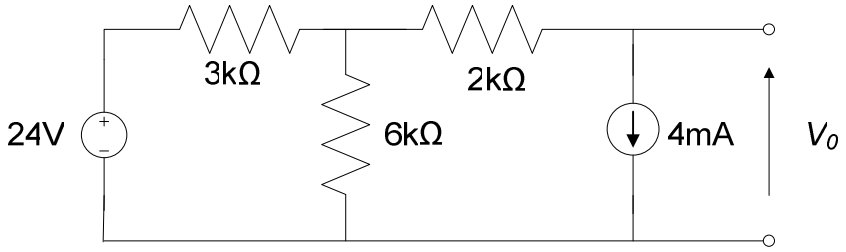


Loop Analysis:

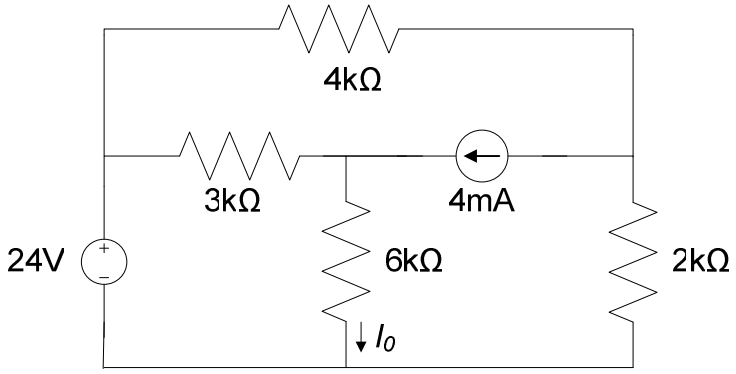
9.9 Use loop analysis to find V_0 in the circuit below.



9.10 Use loop analysis to find V_0 in the circuit below.



9.11 Use loop analysis to find I_0 in the circuit below.



TAs: For resonant circuits:

$$\omega_0 = \frac{1}{\sqrt{LC}}$$

$$Q = \frac{|V_L|}{|V_S|} = \frac{|V_C|}{|V_S|}, \text{ only at } \omega_0$$

$$\Delta\omega = \frac{\omega_0}{Q} \qquad (\Delta\omega\text{=bandwidth})$$

Students are not expected to know the other numerous definitions relating to Q and Δω.

For nodal analysis, take currents entering a node to be +ve.

For quizzes involving loop and nodal analysis, please limit the solving of simultaneous equations to, at the most, two unknowns.