ECE 209L - SECOND ORDER CIRCUITS - LAB 13
PARAMETERS OF SECOND ORDER BANDPASS CIRCUITS

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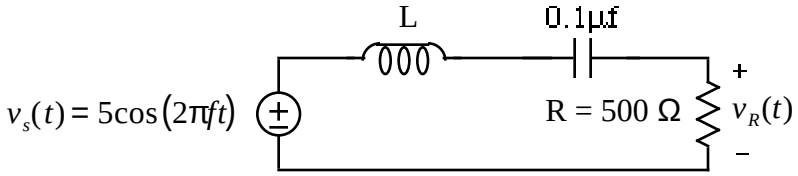
OBJECTIVE

The objective of this lab is to measure and calculate the parameters f_p, f_{BW3dB} and Q_p of second order bandpass circuits like the following



PARTNER 1: L = 10 mh PARTNER 2: L = 20 mh

LAB

1. **Prelab** - Obtain and measure your resistor and capacitor values. Then compare your nominal and measured values. Put your results in a Table

2. Measure the value of the inductor supplied in the lab

3. Build the circuit and then measure the center frequency f_p and the lower and upper 3dB frequencies f_{L3dB} and f_{U3dB}

4. Make use of your results in Problem (3) to calculate the 3dB bandwidth $f_{BW3dB} = f_{U3dB} - f_{L3dB}$ and $Q_p = \dfrac{f_p}{f_{BW3dB}}$

5. **Prelab** - Draw the phasor circuit for your measured values (and given L value) and then calculate the transfer function $G(j\omega) = V_R(j\omega)/V_S$

6. **Prelab** - Make use of your equation in Problem (10) to obtain a Mathcad graph of the transfer function $|G(j2\pi f)| = |V_R(j2\pi f)/V_S|$ with f on a log scale

7. **Prelab** - Find f_p, $f_{BW3dB} = f_{U3dB} - f_{L3dB}$ and $Q_p = \dfrac{f_p}{f_{BW3dB}}$ for your circuit from your graph in Problem (6)

8. Compare your measured and graphical values of f_p, $f_{BW3dB} = f_{U3dB} - f_{L3dB}$ and $Q_p = \dfrac{f_p}{f_{BW3dB}}$

9. Now remeasure f_p, $f_{BW3dB} = f_{U3dB} - f_{L3dB}$ and $Q_p = \dfrac{f_p}{f_{BW3dB}}$ in your circuit for a smaller value of R

10. Describe how the smaller value of R affected f_p, f_{BW3dB} and Q_p

11. Sketch $|G(j2\pi f)| = |V_R(j2\pi f)/ V_S|$ with f on a log scale for the parameters in Problem (10)

12. How did the change in Q_p affect the shape of the frequency response

13. How in general does the size of Q_p affect the frequency response of a 2nd order bandpass