

ECE-311 (ECE, NDSU)
Lab 10 – Experiment
Series and parallel resonance 1: experiments

1. Objective

The objective of this lab is to conduct laboratory experiments to study the behavior of series and parallel LC circuits at resonance. This is a follow-up lab to the previous theoretical and LTSpice simulation-based lab, which studied the same topic.

NOTE: To complete this lab you will need the results you derived and/or the data you observed during your simulations from the previous lab.

2. Experiment

For circuits (a) through (d) in Figure 1, use $C = 0.1 \mu\text{F}$, $L = 100 \text{ mH}$, and $R = 1 \text{ k}\Omega$.

- (1) Build circuit (a) in Figure 1. Connect Ch1 to input and Ch2 to output so that both the input and the output are displayed on the oscilloscope.
- (2) Set the input voltage to $\pm 5\text{V}$ and frequency to the value calculated in the PREPARATION section from the previous lab. Vary the frequency from this theoretical value to get a maximum output voltage magnitude. The frequency at this maximum voltage V_{max} is the resonance frequency.
- (3) If $V_{\text{Cutoff}} = V_{\text{max}}/\sqrt{2}$, vary the frequency again until the output voltage equals V_{Cutoff} . This frequency is the cut-off frequency. There should be 2 cut-off frequencies for each case.
- (4) Calculate the bandwidth by subtracting the 2 cut-off frequencies.
- (5) Calculate the Q factor using the equation from PREPARATION section from the previous lab.
- (6) Repeat steps 1 through 5 for circuits (b) to (d) in Figure 1.
- (7) Compare your result with that from PREPARATION and SIMULATION sections from the previous lab.

- (8) Build circuit (e) in Figure 1. Connect Ch1 to input and Ch2 to output so that both the input and the output are displayed on the oscilloscope. Set the input voltage to $\pm 5\text{V}$ and frequency to the resonance frequency found in step 1 for circuit (b) in Figure 1.
- (9) Find the magnitude for V_C for the following cases.
 - i. $R = 3 \text{ k}\Omega$
 - ii. $R = 300 \Omega$

Compare the result with that from PREPARATION and SIMULATION sections from the previous lab. Explain what you observe.

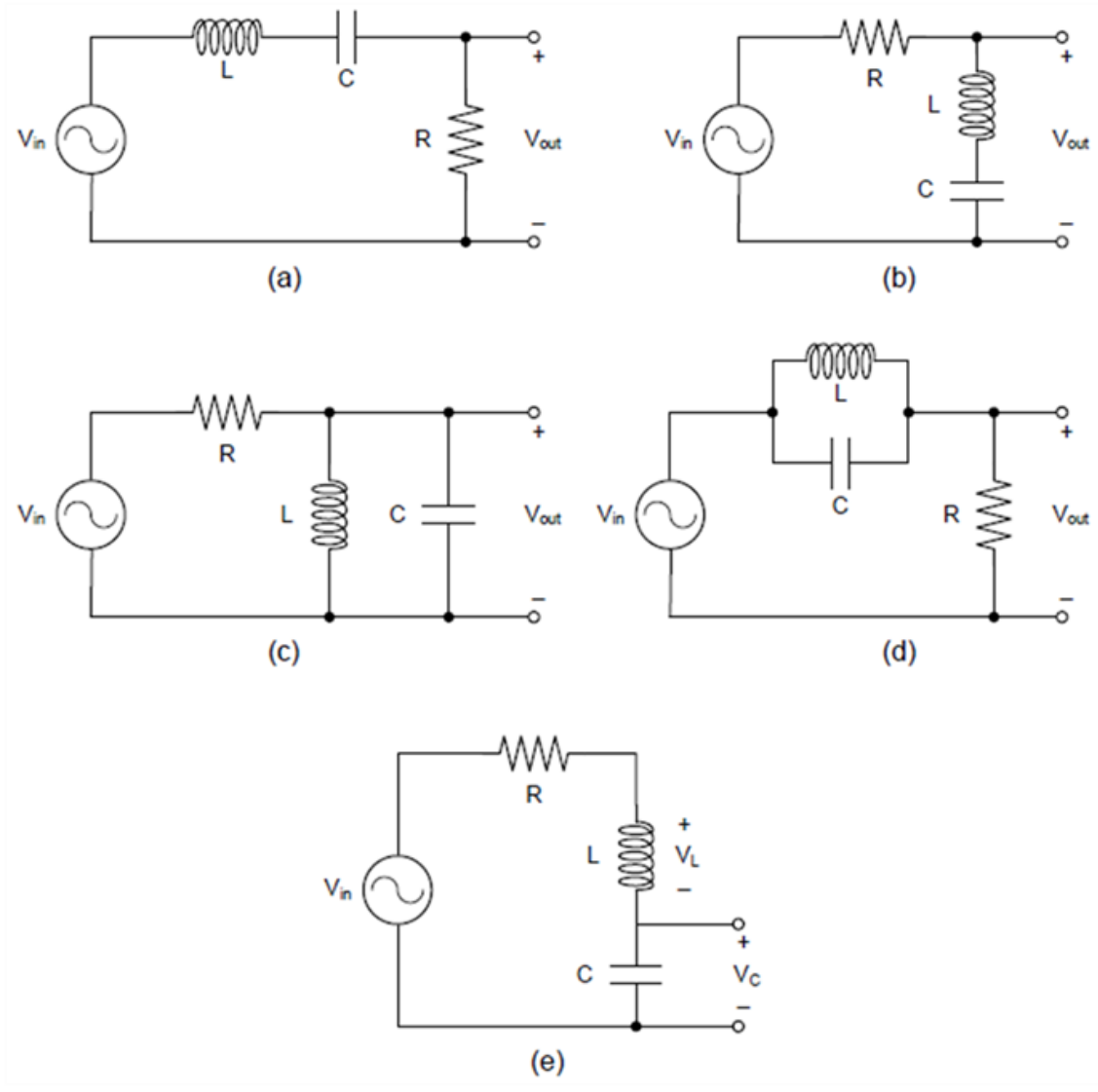


Figure 1: Circuits (NOTE: these are the same circuits as in the previous lab)