

Electrical Circuits II Lab 4 Online – Passive RLC Filter

Objectives

Design and analyze passive RLC filters using LTspice.

Preparation

Complete the following steps before starting to work on the experiments in this lab:

- 1) Complete Lab 3 and associated report.
- 2) Complete lecture, homework, and videos in FEC Chapter 12 “Passive RLC Filter”.
- 3) Watch Bode Plot and AC Simulation video at <https://youtu.be/SuFskVpRf4c>.

Experiment 1

Design a high pass RL filter with cut off frequency at 2000 Hz using 10 Ω resistor. Implement the circuit in LTspice, chart the transfer function as bode plot in dB/decade and label cut off frequency (-3dB point).

Experiment 2

Design a low pass RC filter with cut off frequency at 2000 Hz using 10 Ω resistor. Implement the circuit in LTspice, chart the transfer function as bode plot in dB/decade and label cut off frequency (-3dB point).

Experiment 3

Design a parallel RLC band pass filter with cut off frequencies at 100 and 2000 Hz using 1 μ F capacitor. Implement the circuit in LTspice and chart the transfer function. Implement the circuit in LTspice, chart the transfer function as bode plot in dB/decade and label cut off frequencies (-3dB point).

Experiment 4

Design a series RLC band pass filter with cut off frequencies at 200 and 5000 Hz using 1 μ F capacitors. Implement the circuit in LTspice, chart the transfer function as bode plot in dB/decade and label cut off frequencies (-3dB point).

Experiment 5

Add a 100 Ω load across the output of the band pass filter from experiment 4. Compare the transfer function, center frequency and cut-off frequencies with the 100 Ω load a with the unloaded design from Experiment 4.

Report Requirements

This lab and associated report must be completed individually. All reports must be computer printed (Formulas and Diagrams may be hand drawn) and at minimum:

For each experiment include:

- Clear problem statement in your words.
- Answer to any specific experiment questions (if any)
- Identify the theory or process and associated calculations
- Documents resulting circuit schematics from LTspice, simulation output and additional tables, timing diagram or chart required by the experiment.

For the whole report include:

- A Cover page with your name, class, lab and completion date.
- A Lessons Learned section which summarizes your learning from this lab in 5 sentences or more.
- A New Experiment section that has description of a new experiment and the experiment's results. Experiment should be related to material covered in class but not simply variation of the existing lab experiments.