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| Lab 0: Introduction to LTSpice |

Student Name: Click or tap here to enter text.

Student Number: Click or tap here to enter text.

Preparation

There is no prelab due this week (YAY!)

Q1: LTSpice Simulation

1. **Lowpass filter frequency and time domain responses**

With LTSpice, build a first-order RC lowpass filter with a resistor size of 1kΩand an f3dB of 1kHz (recall f3dB = 1/(2πRC)). Drive your filter with an ideal voltage source and look at the output voltage.

1. Show your schematic.



1. Plot the frequency response and annotate the f3dB on the frequency response plot. **IMPORTANT: LTSpice graphs can be difficult to read unless you change the line width!** To change the line width, run any simulation, click on the graph, go to Tools🡪Control Panel🡪Waveforms and set the Data trace width[\*] to 5.



1. Plot the step response (let the step have a 1ns rise time).



**2. Extract frequency response based on transient simulation**

In practice, frequency response of a circuit from its input to a specific node can be extracted by imposing a sinusoidal signal to its input and measuring the signal amplitude at that node for different frequency in the range of interest. Put a 1V (2VPP) sinusoidal voltage source at the input of your designed lowpass filter.

1. Fill the following table by measuring the output amplitude for each case. Note since the input amplitude has been set to 1, output amplitude represents the gain (VO/VIN). Also, you should run the simulation for an appropriate duration to skip the transient condition (circuit must reach steady state condition without any variation in amplitude or dc value).

Table 1: Measurement results

|  |  |  |
| --- | --- | --- |
| f (kHz) | Gain | Gain (dB) |
| 0.01 | Click or tap here to enter text. | Click or tap here to enter text. |
| 0.1 | Click or tap here to enter text. | Click or tap here to enter text. |
| 0.5 | Click or tap here to enter text. | Click or tap here to enter text. |
| 1 | Click or tap here to enter text. | Click or tap here to enter text. |
| 2 | Click or tap here to enter text. | Click or tap here to enter text. |
| 5 | Click or tap here to enter text. | Click or tap here to enter text. |

1. Sketch the frequency response based on your measurements.



1. Compare your results with previous section.

Click or tap here to enter text.

**3. Hand-in Material**

This report is to be completed during the lab period by filling out this pre-made template and handed in within 30 minutes after the end of the session.