

Digital Communications Lab

Lab #7

Experiment

1. Design and build a first order R/C low pass filter that has a cutoff frequency of 10 kHz. Test the filter by putting in sine waves at different frequencies. Measure both the amplitude and phase change from input to output. Compare to ideal.
2. Design and build a first order R/C high pass filter that has a cutoff frequency of 10 kHz. Test the filter by putting in sine waves at different frequencies. Measure both the amplitude and phase change from input to output. Compare to ideal.
3. Design and build a second order low pass filter using only resistors and capacitors, which has a cutoff frequency of 10 kHz. Try to get the gain as close to constant as you can from DC to 10 kHz, and as close to -40 dB/decade as you can for everything above 10 kHz. Avoid having a resonate peak as much as possible, and also avoid having any range where the gain has a slope of -20 dB/decade if you can. Measure the performance of the filter to see if it works the way you think.
4. Design a second order low pass filter using two first order filters, with an amplifier between the stages. The filter should have a cutoff frequency of 10 kHz. Try to get the gain as close to constant as you can from DC to 10 kHz, and as close to -40 dB/decade as you can for everything above 10 kHz. Avoid having a resonate peak as much as possible, and also avoid having any range where the gain has a slope of -20 dB/decade if you can. Measure the performance of the filter to see if it works the way you think. Was this harder, or easier, to build than the filter in the previous step, which did not use an amplifier.
5. Design and build a bandpass filter, that will pass signals from 1 kHz to 10 kHz. You may use as many resistors, capacitors, inductors and amplifiers as you wish. Measure the frequency response of the filter.