

Name: _____ **Date:** _____

Introduction

In this exercise you will investigate the idea of low and high pass filters.

Procedure

High-Pass Filter

- 1) Given the **high-pass filter** circuit shown in Figure 9.1(a), simulate the circuit shown in PSpice in order to determine the **open-circuit** (i.e. – with no load resistor) characteristics of the filter.

Perform an **AC Sweep**, with the parameters:

Start Freq. = 100Hz, End Freq. = 100kHz, 1001 Pts/Decade

Plot the magnitude of the voltage gain $A_V = V_{Load}/V_S$ (in dB) and the phase angle of V_{Load} on two separate full-page graphs. Invert the colors of the plots so the graphs have white backgrounds.

- 2) Using the plots obtained from step one, determine the cutoff frequency of the filter.

$$f_{c(HP)} = \text{_____ Hz}$$

- 3) Using a straight-edge, accurately sketch the Idealized Bode Plots for the filter on the printed graphs.

- 4) Repeat the PSpice simulation of the **high-pass filter** circuit in order to determine the operational characteristics of the filter with the load resistor connected to the output terminals.

Once again, plot the magnitude of the voltage gain $A_V = V_{Load}/V_S$ (in dB) and the phase angle of V_{Load} on two separate graphs and accurately sketch the Idealized Bode Plots for the filter on the printed graphs.

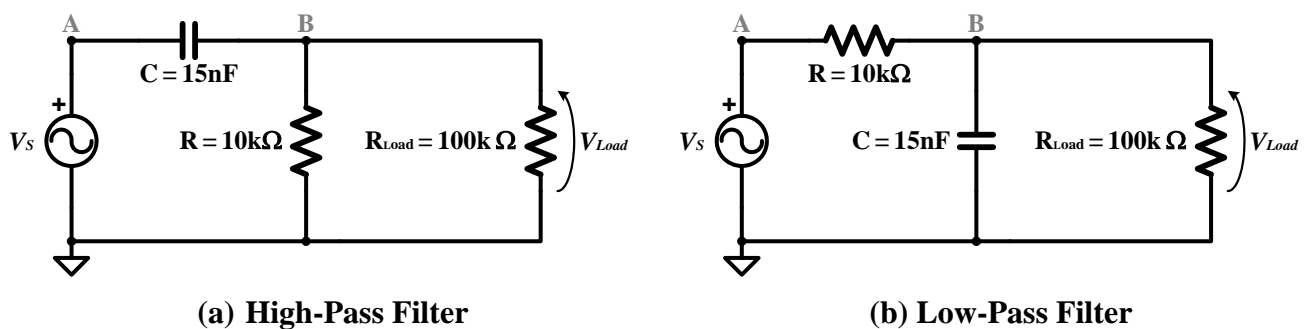


Figure 9.1 – Filter Circuits

Low-Pass Filter

- 5) Given the **low-pass filter** circuit shown in Figure 9.1(b), simulate the circuit shown in PSpice in order to determine the **open-circuit** (i.e. – with no load resistor) characteristics of the filter.

Plot the magnitude of the voltage gain $A_V = V_{Load}/V_S$ (in dB) and the phase angle of V_{Load} on two separate graphs and accurately sketch the Idealized Bode Plots for the filter on the printed graphs.

- 6) Using the plots obtained from step one, determine the cutoff frequency of the filter.

$$f_{c(LP)} = \text{_____ Hz}$$

- 7) Repeat the PSpice simulation of the **high-pass filter** circuit in order to determine the operational characteristics of the filter with the load resistor connected to the output terminals.

Plot the magnitude of the voltage gain $A_V = V_{Load}/V_S$ (in dB) and the phase angle of V_{Load} on two separate graphs and accurately sketch the Idealized Bode Plots for the filter on the printed graphs.

Additional Analysis

- 1) Determine the actual cutoff frequencies of the “loaded” filters (i.e. – with the load resistors connected) from the PSpice plots and compare the results with the previously-determined open-circuit cutoff frequencies. Explain any differences.