

# Lab 3, SFWR ENG 3DX4

## Introduction to Computer-Based Control

### PRELAB EXERCISES

Prelabs due the week of: **March 4, 2024**

The Root Mean Square (RMS) value of a signal  $f(t)$  that is periodic with period  $T$  is given by the equation

$$\sqrt{\frac{1}{T} \int_0^T (f(t))^2 dt}$$

RMS values are often easier to measure and more accurate than trying to determine peak amplitudes. It can be shown that the RMS value of  $u(t) = B \sin \omega t$  is  $\frac{B}{\sqrt{2}}$ .

1. Find the RMS values of the following waveforms:

- (a) Square wave

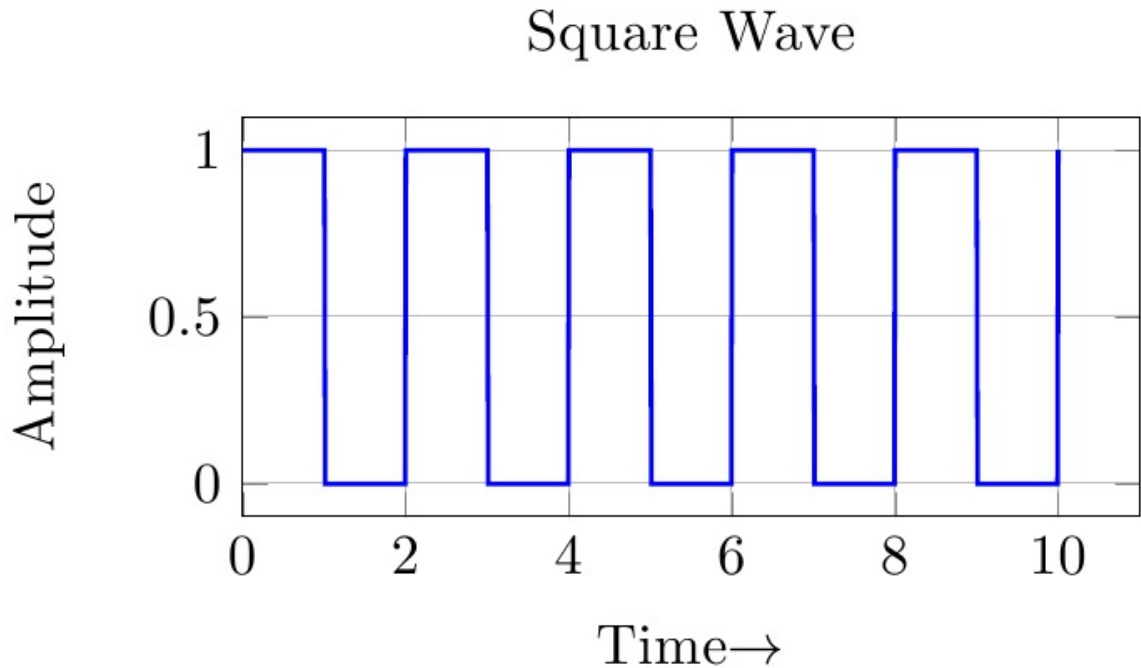


Figure 1: Square wave signal

- (b) Sawtooth wave

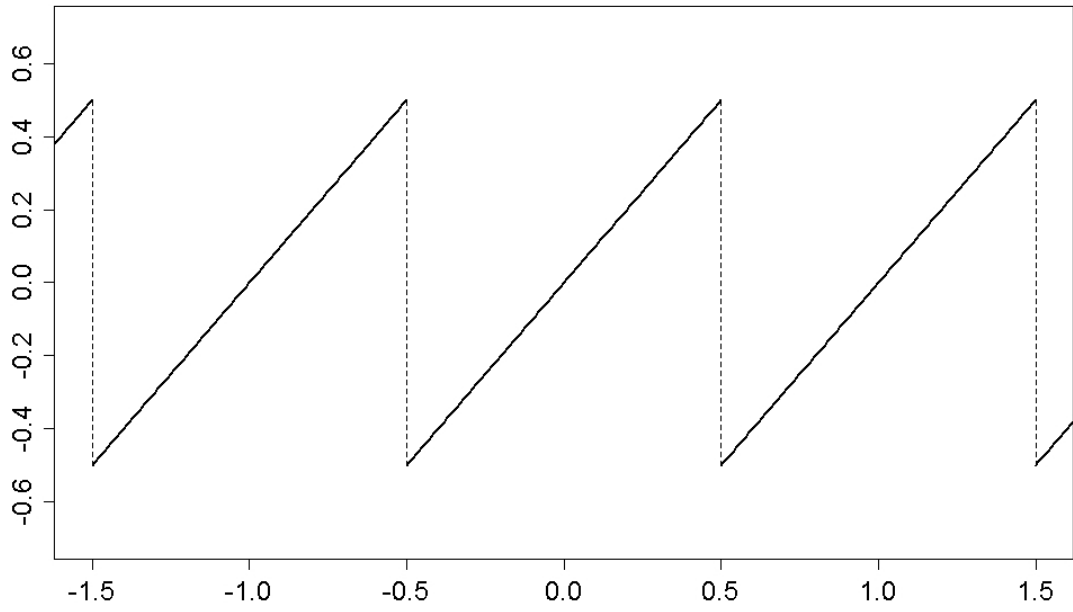


Figure 2: Sawtooth wave signal

(c) Sine wave

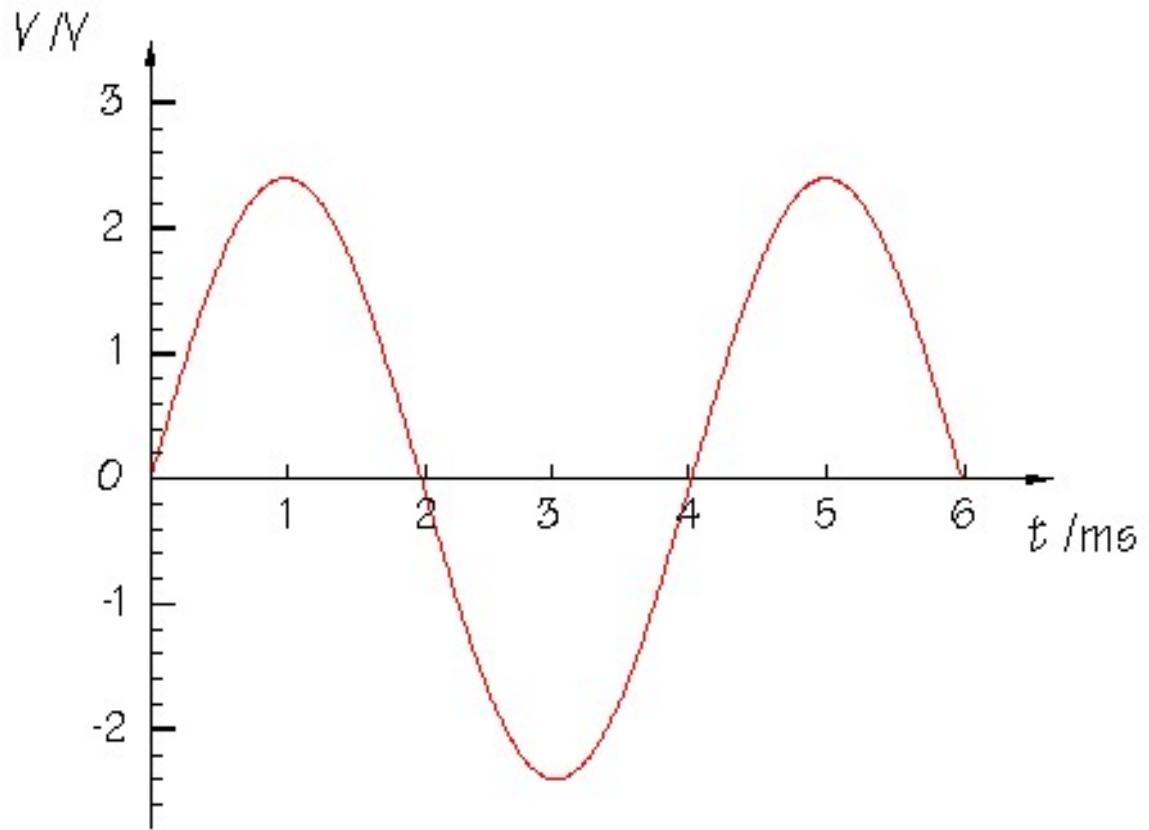


Figure 3: Sine wave signal

2. Find the cutoff frequency of the following low-pass filters.
  - (a) Bode plot 1

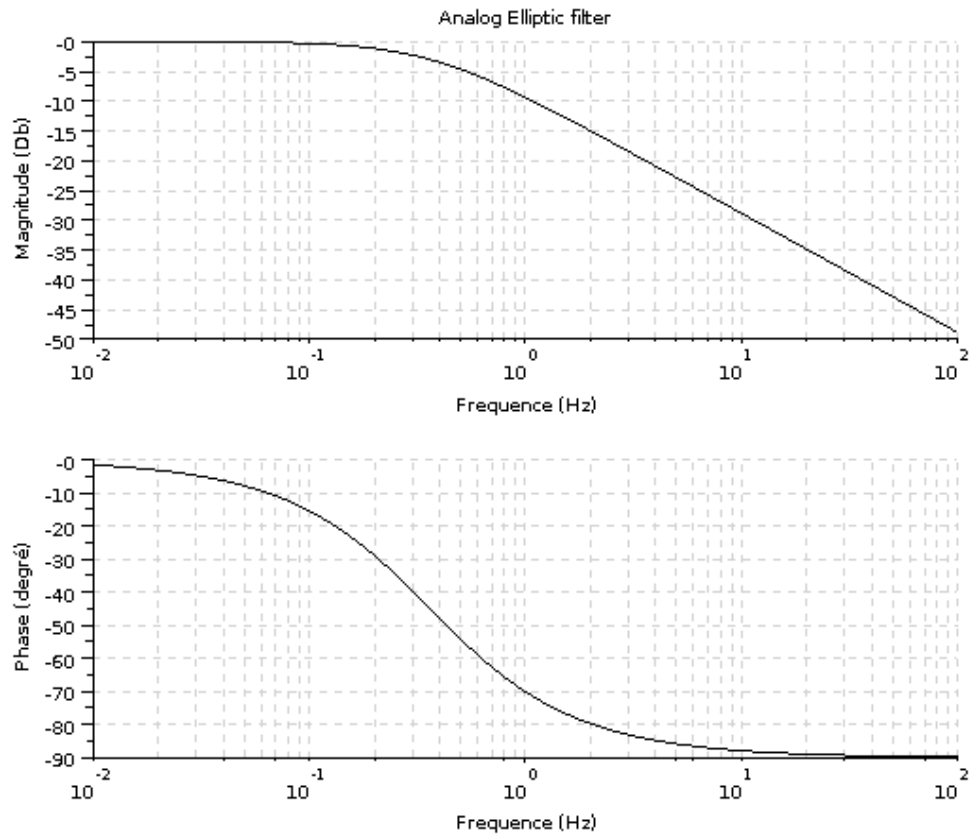


Figure 4: A Bode plot of a low-pass filter.

(b) Bode plot 2

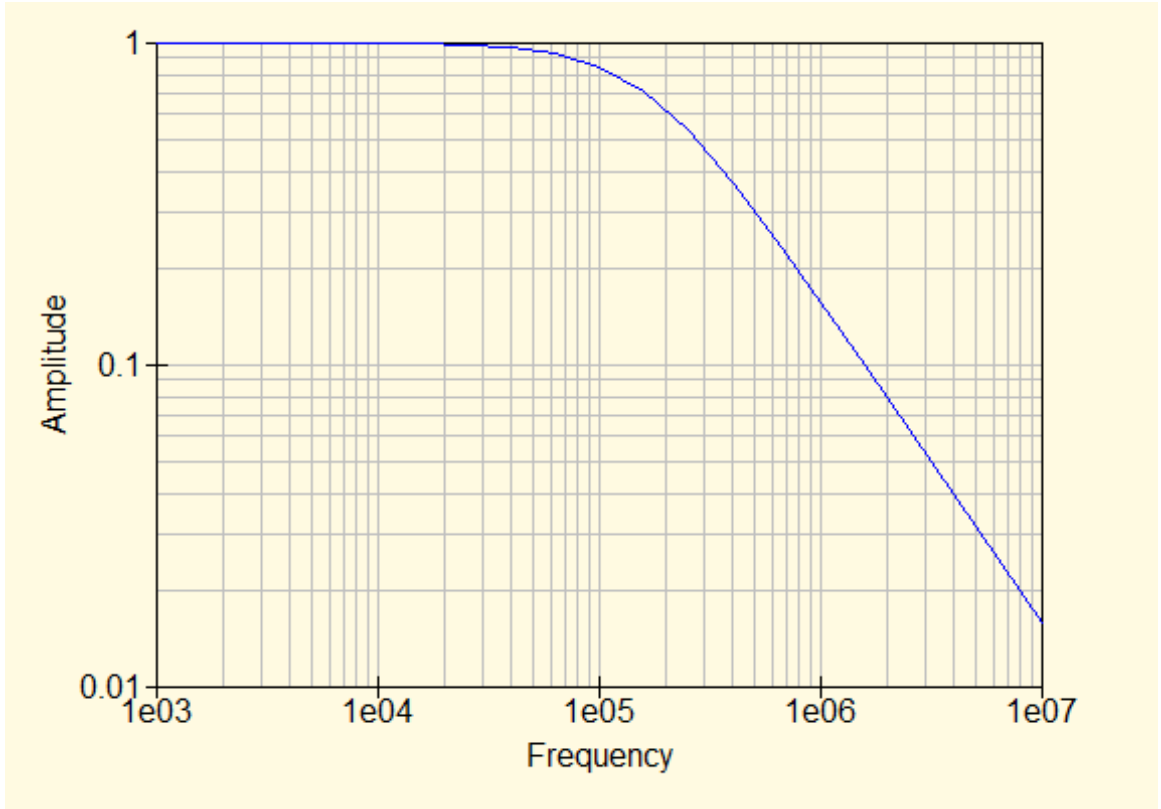


Figure 5: Another Bode plot of a low-pass filter.

(c) Bode plot 3

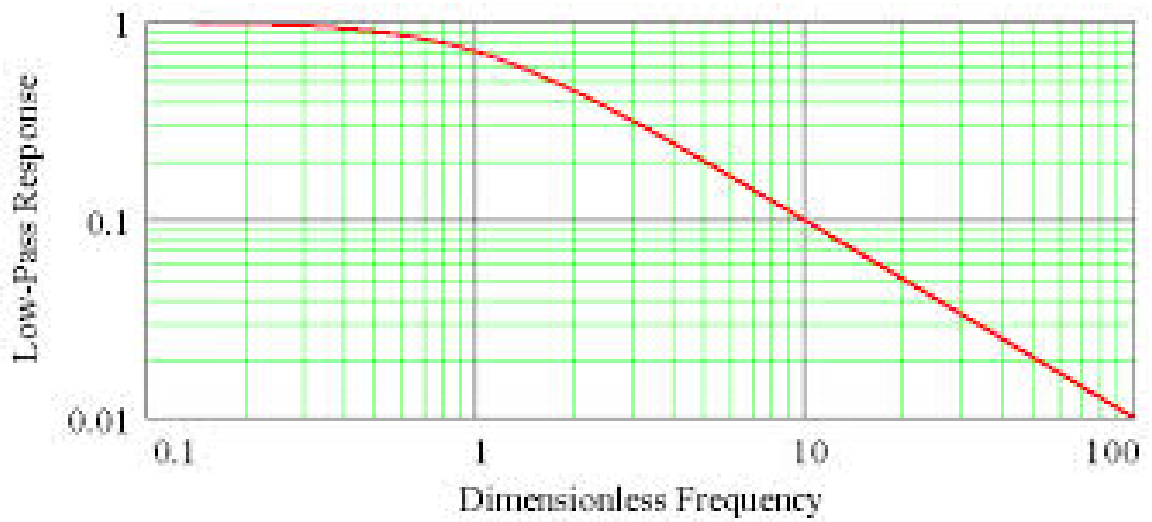


Figure 6: Yet another Bode plot of a low-pass filter.