Low Pass Filter GUI Documentation

M File Use

INTRODUCTION

The Low Pass Filter GUI was designed to be used to assist in a student's understanding of a sinusoidal signal's distortion caused by a low pass RC circuit. This GUI allows the user to vary the time constant and unit amplitude excitation frequency and view the resulting time/frequency response.

Instruction on GUI usage will be shown in this document. For further explanation on the topic of RC circuit responses, see the First Order System Tutorial.

FILES NEEDED TO USE STEP RESPONSE GUI

- low_pass_filter.fig
- low_pass_filter.m
- low_pass_filter.p
- RC.JPG

RUNNING THE LOW PASS FILTER GUI

With the proper working directory selected, type 'low_pass_filter' in the MATLAB® command window

Figure 1 shows the appearance of the GUI after it is first opened. There are initial values selected for the time constant and the unit amplitude excitation frequency in Hz. These values can be changed by inputting a value manually by selecting the respective value field, or by using the respective slider bars.

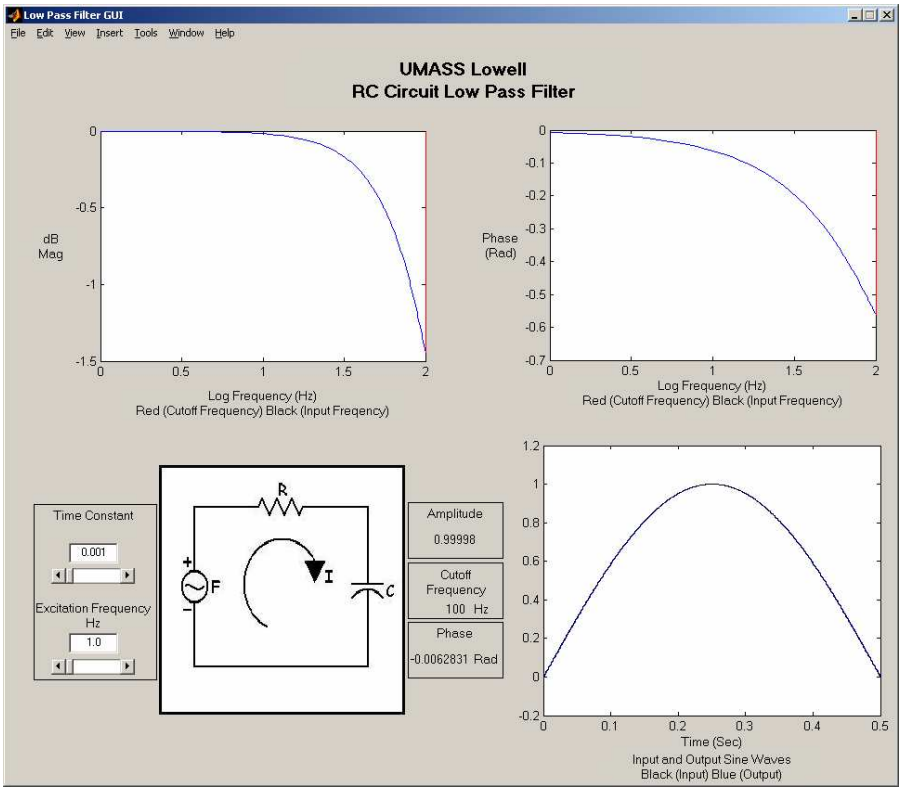
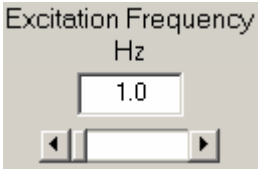


Figure 1: Low Pass Filter GUI

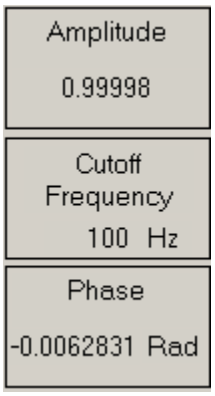
Allowable input values

- Time Constant: 0.001 – .03



- Excitation Frequency: 0 – 70

With the given time constant and excitation frequency, the magnitude (dB mag), phase (rad) and time domain output of the filtered signal over a 200 Hz range are calculated and plotted in their respective fields. The red line indicates the cutoff frequency, the black line indicates the input frequency, and blue represents the output signal. Presented in the field to the right of the RC circuit illustration is the resulting amplitude and phase distortion of the given excitation frequency and the cutoff frequency related to the time constant.



The value shown in the Cutoff Frequency can be copied and used in the Excitation field. This value will result in the display of a 3 dB amplitude reduced time response.