Laboratory 04

Filter Design using MATLAB

E/15/366
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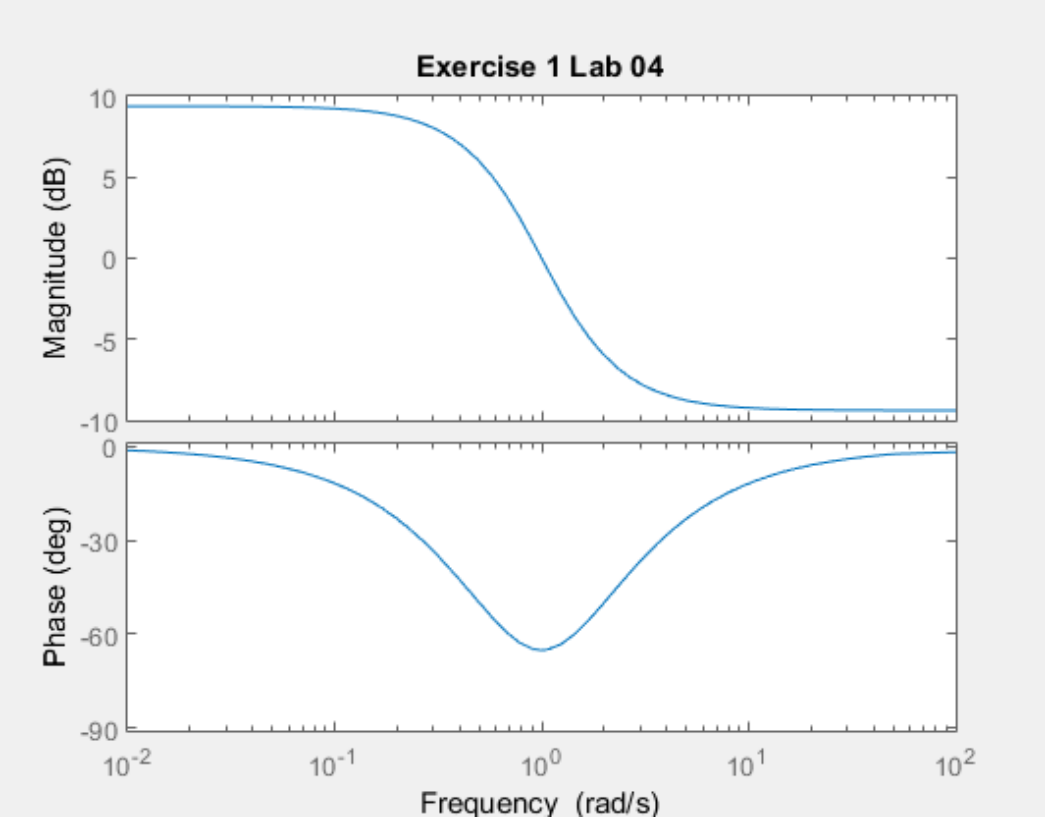
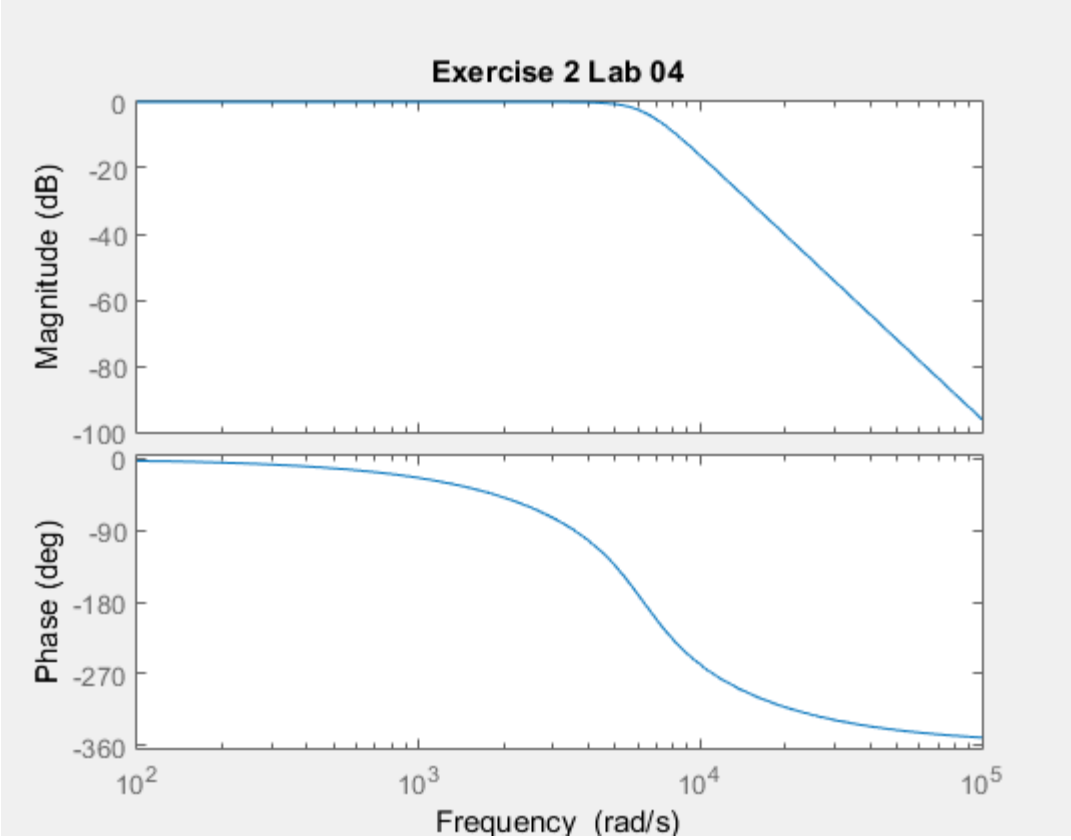
01.

```
%Exercise 1 : Design    the Butterworth filter with the
following %specifications: Fp = 1000 Hz; Fs =5000Hz;

Fp=1000;
Fs=5000;

Rp=2;   %Rp is the maximum passband attenuation in dB
Rs=50;  %Rs is the minimum passband attenuation in dB
Fsample=10000;

Wp=(2*pi*Fp)/Fsample;     %Wp is the passband edge angular
frequency in rad/sec
Ws=(2*pi*Fs)/Fsample;     %Ws is the stopband
edge angular frequency in rad/sec

[n,Wn] = buttord(Wp,Ws,Rp,Rs,'s');     % lowest order N
of a butterworth
disp([n,Wn]);   % display the values

[b,a] = butter(n,Wn);
bode(b,a);          %Bode plot of the response
title('Exercise 1 Lab 04')
```



02.

```
%Exercise 2   Design the Butterworth filter with Fp =1000Hz,N=4;

clear all;
fp=1000;
N=4;

Wp=2*pi*fp;
%design an order N low pass transfer function
[num,den]=butter(N,Wp,'s');
filter2=tf(num,den);
bode(filter2);                  % bode plot the response
title('Exercise 2 Lab 04')
```



03.

```
%Exercise 3 Design Chebyshev Type 1 filter with N = 4, Rp = 2;
%Fp =1000.

clear all;

% Chebyshev Type I analog lowpass filter prototype
[z,p,k]=cheb1ap(4,2);
% numerator and denominator of H(s)
%Convert zero-pole-gain filter parameters to transfer function
%form
[num,den]=zp2tf(z,p,k);
freqs(num,den); %Frequency response of analog filters
title('Exercise 3 Lab 04')
```