**Course Name: Analog Communication**

**MATLAB Experiment-5**

**Objective**: Design two low pass filters with transfer function, i.e. linear phase and , i.e. non-linear phase. Find the response of the multi-tone signal

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for two filters. Draw the amplitude, phase spectra of the filters, and compare them. Also, comment to the obtained results.

**MATLAB Code:**

t=0:0.001:10; % time scale

k=0:1:10000; % samples of fft

x=0.5\*cos(2\*pi\*10\*t)+cos(2\*pi\*20\*t)-0.2\*cos(2\*pi\*30\*t); % input with some phase & frequency

h(t>=0)=exp(-t); % impulse response of linear filter

h1(t>=0)=(2/1.732)\*exp(-0.5\*t).\*sin(1.732\*0.5\*t); % impulse response of non-linear filter

H=fft(h); % 10001 samples of Fourier transform of linear filter

H1=fft(h1); % 10001 samples of Fourier transform of non-linear filter

X=fft(x); % Fourier transform of input

Y=H.\*X; % frequency response of linear filter

Y1=H1.\*X; % frequency response of non-linear filter

y=ifft(Y); % time domain response of linear filter

y1=ifft(Y1); % time domain response of non-linear filter

subplot(321)

plot(t,x)

xlabel('time(sec)');

ylabel('x(t)');

legend('Input Signal')

subplot(322)

plot(t,0.001\*y)

xlabel('time(sec)');

ylabel('y(t)');

legend('Filtered Response Linear Filter')

title('Linear Filter')

subplot(323)

plot(t,0.001\*y1)

xlabel('time(sec)');

ylabel('y(t)');

legend('Filtered Response Non-Linear Filter')

title('Non-Linear Filter')

subplot(324)

plot(k,0.001\*abs(H),k,0.001\*abs(H1))

xlabel('frequency(Hz)');

ylabel('Magnitude Response');

legend('Linear Filter','Non-Linear Filter')

title('Magnitude Response')

subplot(325)

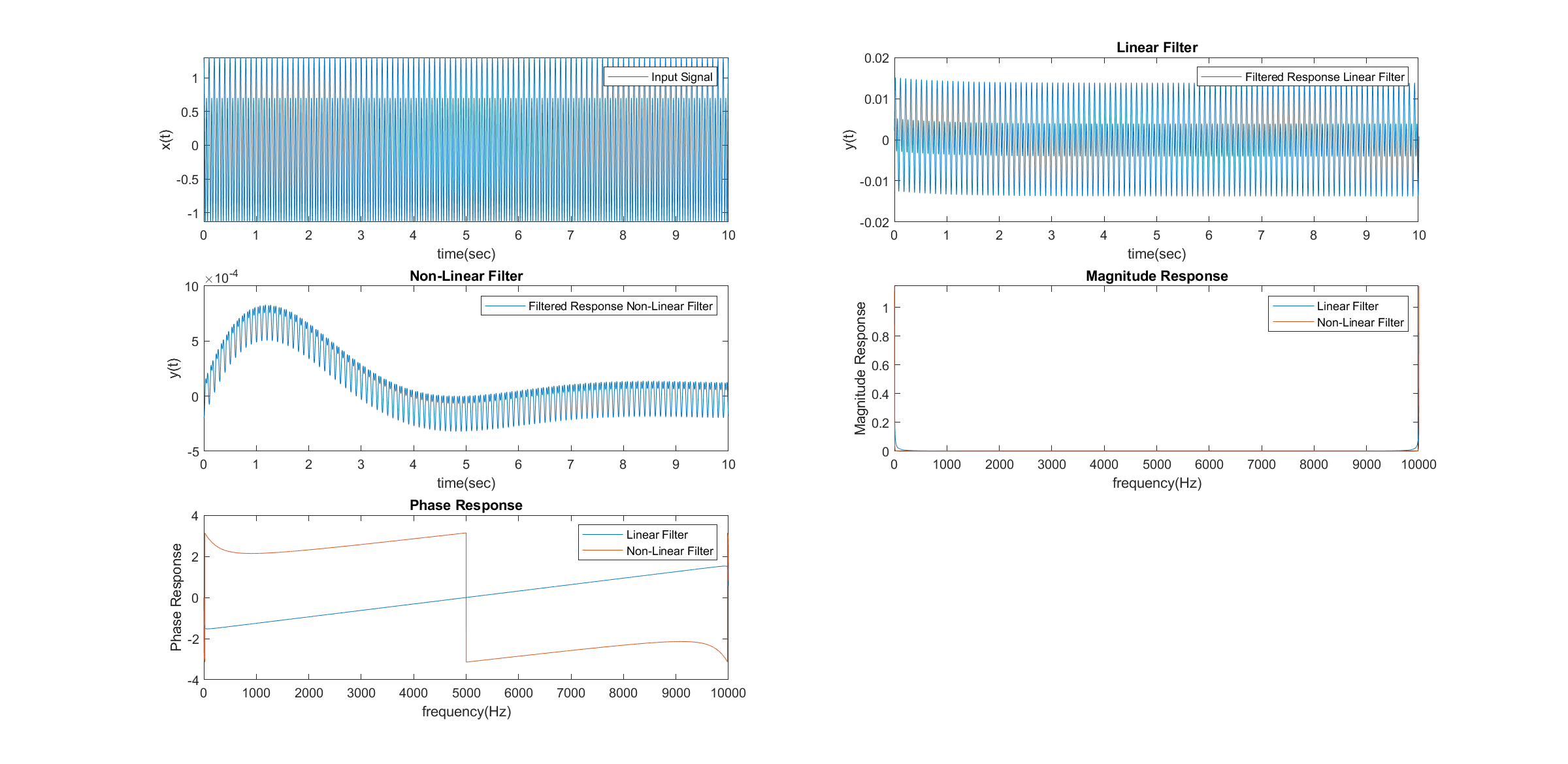
plot(k,angle(H),k,angle(H1))

xlabel('frequency(Hz)');

ylabel('Phase Response');

legend('Linear Filter','Non-Linear Filter')

title('Phase Response');

**Result:**