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```
%%%John Pratt
%%%Lab HW #8
%%%ECE-2026
%%%Section L05
%%%Rec: Prof. Zhang
%%%Lecture: 11 AM
%%%12-Mar-2015
%%%HW Grader: S. Wang
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

a)

```
%NOTE: The plotspec code is commented out to prevent a duplicate plot
%      in part (d).

clear;clc;
load('speechbad.mat');
%plotspecDB(xxbad,8000,256,1);
%fsamp of 8000Hz as given in problem statement, Lsect of 128 after guess
%and check, and DBrange of 25 because all values from 1-99 yielded the same
%plot
```

b)

```
bk1 = [1,-2*cos(2*pi*1555/8000),1];
bk2 = [1,-2*cos(2*pi*2222/8000),1];
bk = conv(bk1,bk2);

%bk1 and bk2 are based on the nulling FIR filter formula given in section
%2.4 of this lab.  Convolve these two to come up with the equivalent set of
%coefficients of the cascade of the systems.  Convolve these with the input
%signal to get the filtered, understandable signal.
```

c)

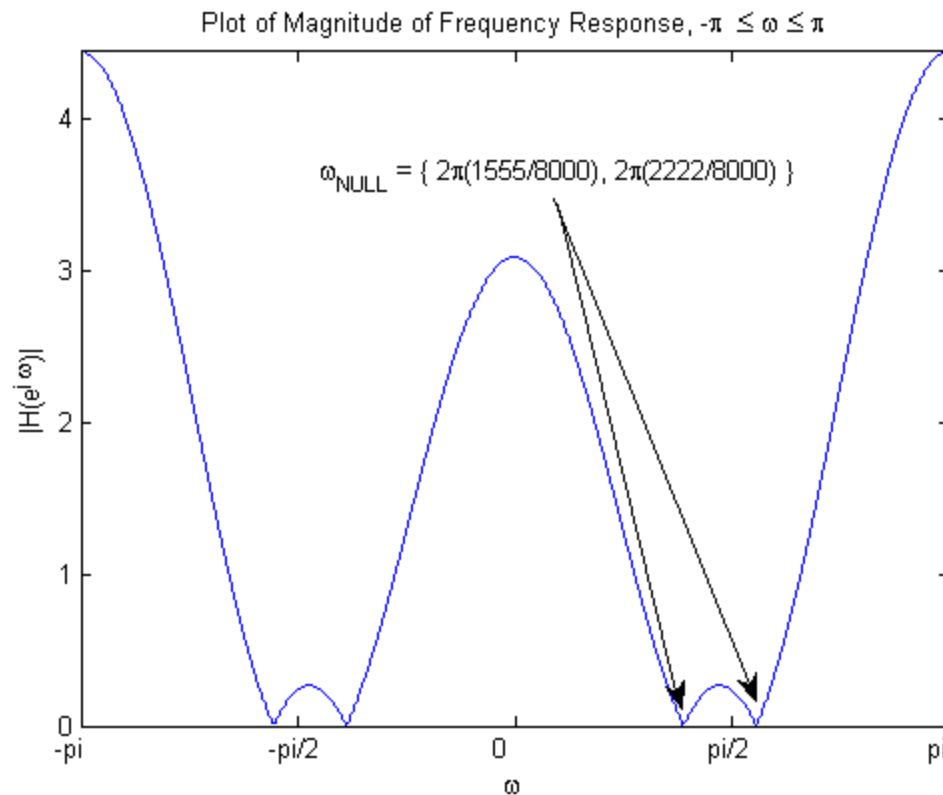
```
%NOTE: All code in part C must be commented out after generating
%      figures so that duplicate figures are not inserted when the whole
%      file is published.

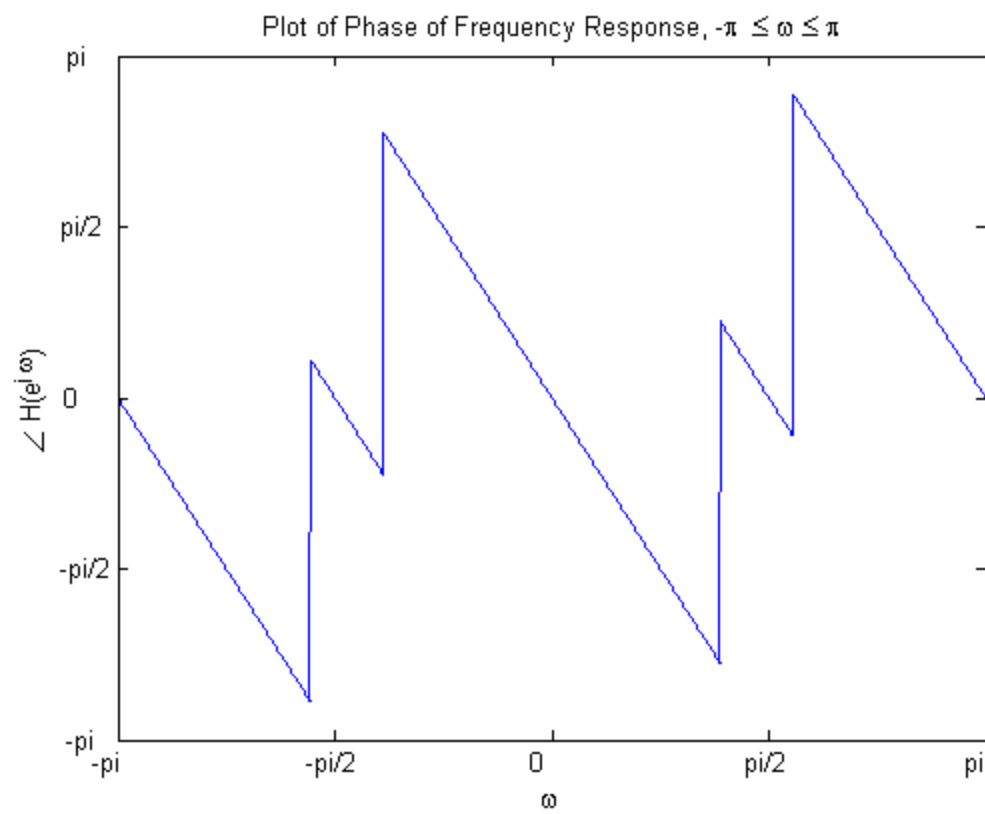
%{
ww = -pi:1/1000:pi;
```

```

freq = freqz(bk,1,ww);
figure;
plot(ww,abs(freq));
title(['Plot of Magnitude of Frequency Response,  $-\pi \leq \omega \leq \pi$ ...  
'\pi']);
xlabel('\omega');
ylabel('|H(e^{j \omega})|');
axis([-pi,pi,0,max(abs(freq))]);
set(gca,'XTick',[-pi;-pi/2;0;pi/2;pi]);
set(gca,'XTickLabel', ['-pi ','-pi/2 ','0 ','pi/2 ','pi ']);
set(gca,'YTick',[0;1;2;3;4;5]);
figure;
plot(ww,angle(freq));
title(['Plot of Phase of Frequency Response,  $-\pi \leq \omega \leq \pi$ ...  
'\pi']);
xlabel('\omega');
ylabel('\angle H(e^{j \omega})');
axis([-pi,pi,-pi,pi]);
set(gca,'XTick',[-pi;-pi/2;0;pi/2;pi]);
set(gca,'XTickLabel', ['-pi ','-pi/2 ','0 ','pi/2 ','pi ']);
set(gca,'YTick',[-pi;-pi/2;0;pi/2;pi]);
set(gca,'YTickLabel', ['-pi ','-pi/2 ','0 ','pi/2 ','pi ']);
%}
openfig('magfig.fig');
openfig('phasefig.fig');
figure;

```



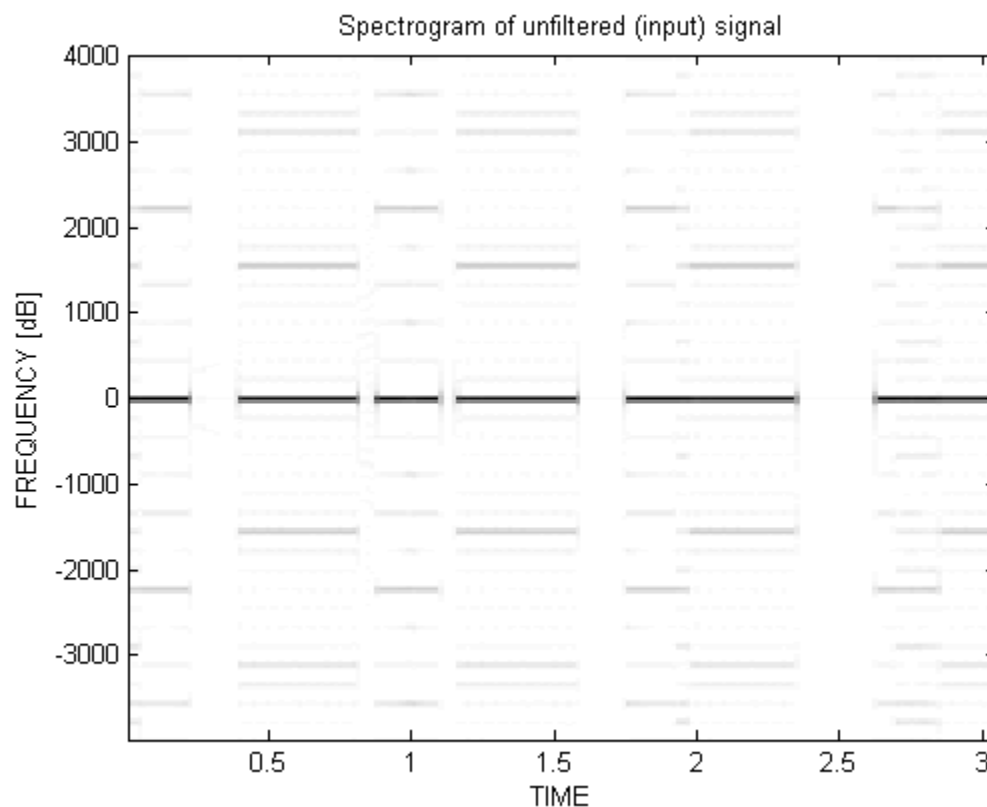


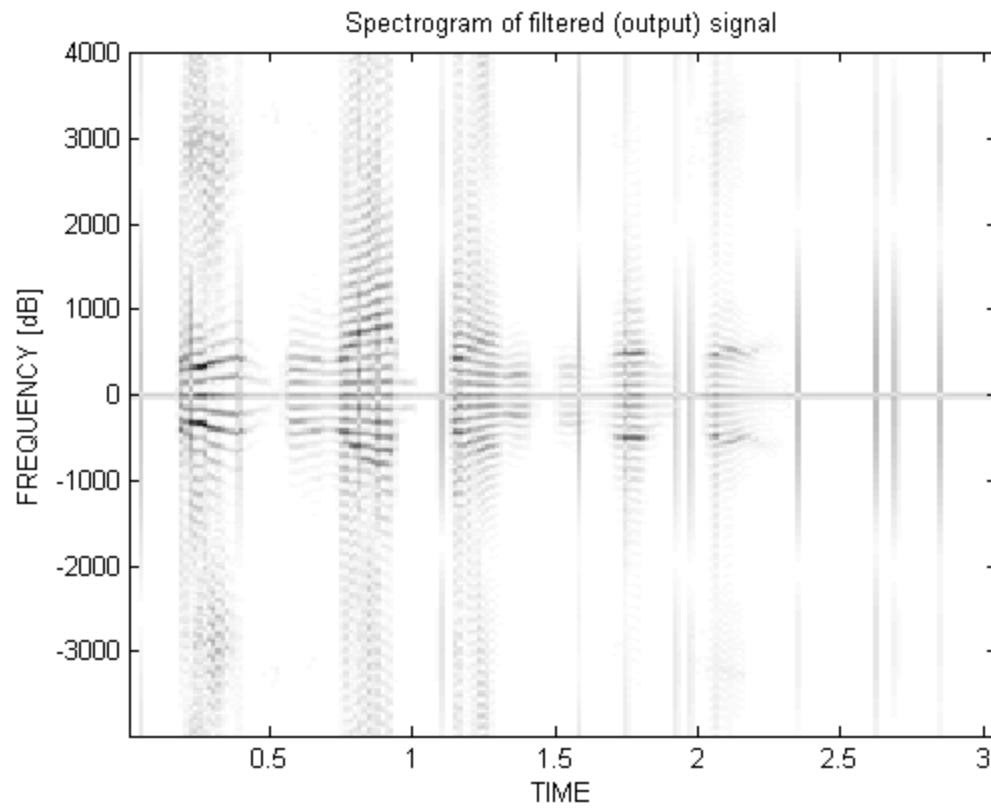
d)

```
xxgood = conv(xxbad,bk);  
plotspecDB(xxbad,8000,256,1);  
title('Spectrogram of unfiltered (input) signal');  
xlabel('TIME');  
ylabel('FREQUENCY [dB]');  
figure;  
plotspecDB(xxgood,8000,256,1);  
title('Spectrogram of filtered (output) signal');  
xlabel('TIME');  
ylabel('FREQUENCY [dB]');  
sound(xxgood); %"Thieves who rob friends deserve jail."
```

%Values used for fsamp, Lsect, and maxDB are explained in (a) above.

%In the original plot of decibel frequency vs time, there is a complete
%lack of any sort of waveform in the human vowel range. When the signal is
%filtered, there is clearly more fluctuation in the decibel frequency,
%associated with the human vowel frequency range and natural speech
%patterns.





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