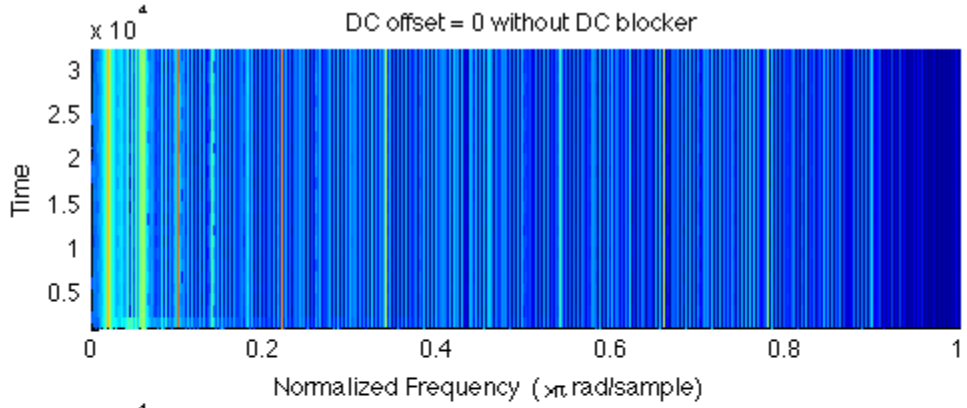
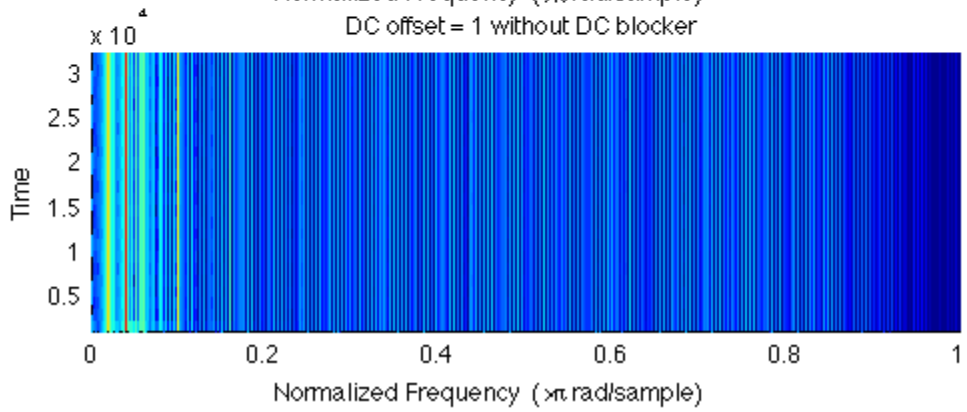
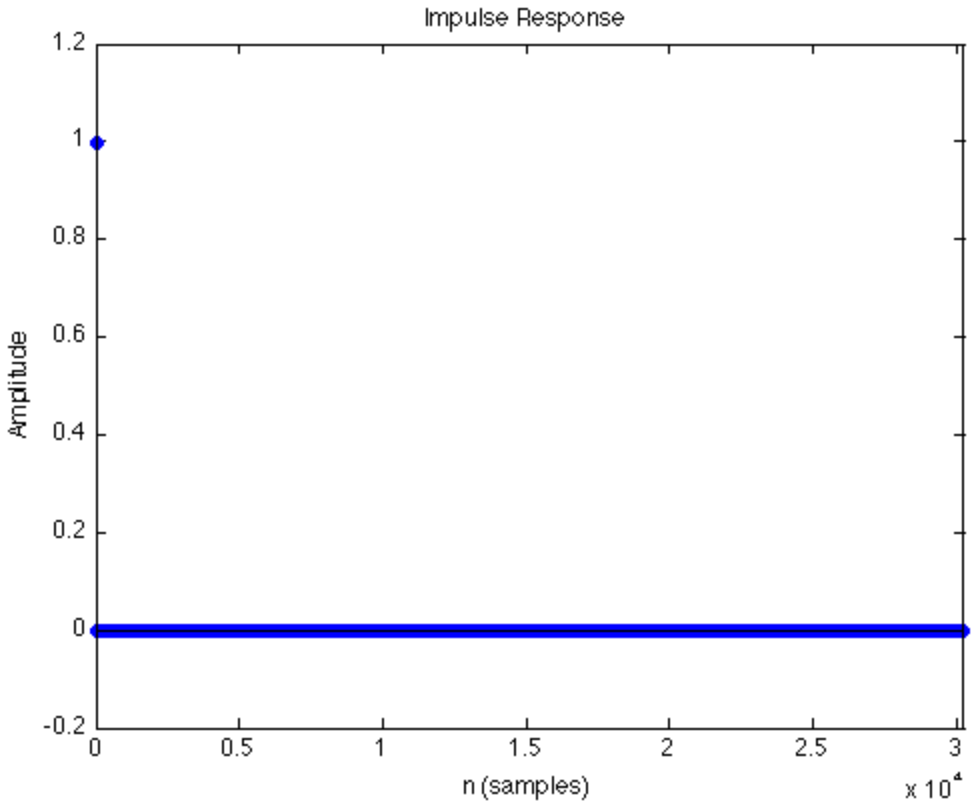
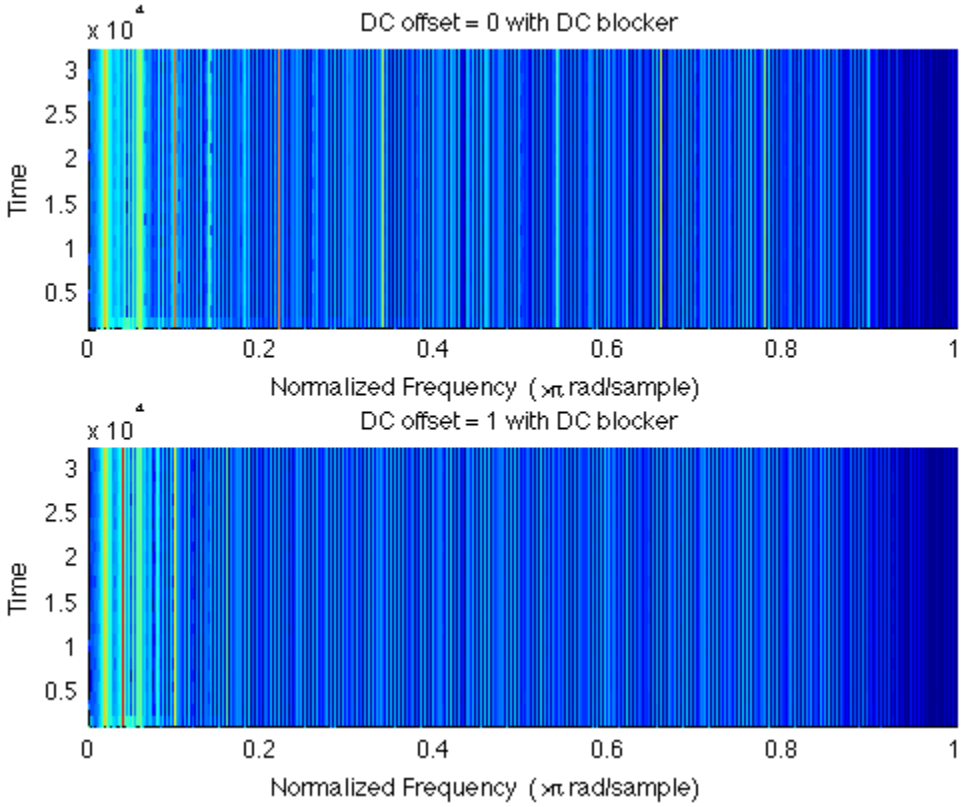
```
% question 2a

% if an offset is added to the output of the non-linearity, theoretically
% the sound remains the same since the vibrations created would be the same
%, just about a different 'mean'.

% question 2b


[y,fs] = wavread('sineDist00.wav');

[z,fs] = wavread('sineDist10.wav');

figure()
subplot(2,1,1), spectrogram(y(:,1),blackman(16384));
title('DC offset = 0 without DC blocker')
subplot(2,1,2), spectrogram(z(:,1),blackman(16384));
title('DC offset = 1 without DC blocker')

% the 2 plots are for DC Offset of 0.5 and 0.9
% DC Offset 0.5 has more energy and is spread out near the fundamental and
% its harmonics. For DC Offset 0.9, the energy gets narrowly concentrated
% near the fundamental and their harmonics. Both of them have even an odd
% harmonics

%  question 2c
%
b = [1 0 0];
a = [1 2*2*pi*5 2*pi*5*2*pi*5];


[bz,az] = bilinear(b,a,48000);
figure()
impz(bz,az);

% the impulse response settles in 1 sample according to the above
% calculations.

[y,fs] = wavread('sineDist00dc.wav');
[z,fs] = wavread('sineDist10dc.wav');

figure()
subplot(2,1,1), spectrogram(y(:,1),blackman(16384));
title('DC offset = 0 with DC blocker')
subplot(2,1,2), spectrogram(z(:,1),blackman(16384));
title('DC offset = 1 with DC blocker')
```


DC offset = 0 without DC blocker
x 10^4
Time
3
2.5
2
1.5
1
0.5
0
0.2
0.4
0.6
0.8
1
Normalized Frequency (×π rad/sample)


DC offset = 1 without DC blocker
x 10^4
Time
3
2.5
2
1.5
1
0.5
0
0.2
0.4
0.6
0.8
1
Normalized Frequency (×π rad/sample)


Impulse Response
Amplitude
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
0
0.5
1
1.5
2
2.5
3
n (samples)
x 10^4



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