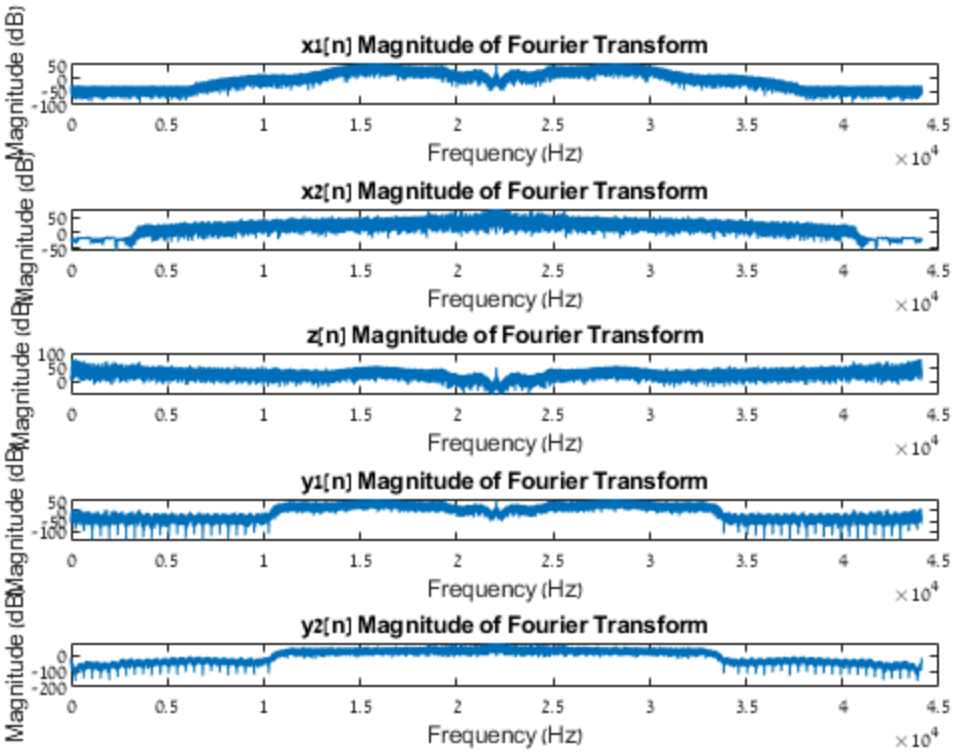
```
clear;clc;

[x1,Fs_x1] = audioread('x1.mp4');
T_x1=1/Fs_x1;
[x2,Fs_x2] = audioread('x2.mp4');
T_x2=1/Fs_x2;

h=fir1(100,0.5,"low");

x1_DTFT=fftshift(fft(x1));
magnitude_x1_DTFT=abs(x1_DTFT);
db_x1=20*log10(magnitude_x1_DTFT);
len_x1 = length(x1_DTFT);
frequency_x1 = (0:len_x1-1)*(Fs_x1/len_x1);
subplot(5,1,1);
plot(frequency_x1,db_x1);
xlabel('Frequency (Hz)');
ylabel('Magnitude (dB)');
title('x1[n] Magnitude of Fourier Transform');

x2_DTFT=fftshift(fft(x2));
magnitude_x2_DTFT=abs(x2_DTFT);
db_x2=20*log10(magnitude_x2_DTFT);
len_x2 = length(x2_DTFT);
frequency_x2 = (0:len_x2-1)*(Fs_x2/len_x2);
subplot(5,1,2);
plot(frequency_x2,db_x2);
xlabel('Frequency (Hz)');
ylabel('Magnitude (dB)');
title('x2[n] Magnitude of Fourier Transform');

N2 = length(x2);
n2 = 0 : N2-1;
n2=n2.';
z = x1 + ((-1).^n2).*x2;

z_DTFT=fftshift(fft(z));
magnitude_z_DTFT=abs(z_DTFT);
db_z=20*log10(magnitude_z_DTFT);
len_z = length(z_DTFT);
Fs_z=lcm(Fs_x1, Fs_x2);
frequency_z = (0:len_z-1)*(Fs_z/len_z);
subplot(5,1,3);
plot(frequency_z,db_z);
xlabel('Frequency (Hz)');
ylabel('Magnitude (dB)');
title('z[n] Magnitude of Fourier Transform');

h=fir1(100,0.5,"low");
h=h.';
h_zeropad = [h; zeros(length(z)-length(h), 1)];
```

```
y1 = conv(h_zeropad, z);
y1_DTFT = fftshift(fft(y1));
magnitude_y1_DTFT = abs(y1_DTFT);
db_y1 = 20*log10(magnitude_y1_DTFT);
len_y1 = length(y1_DTFT);
Fs_y1 = Fs_z;
frequency_y1 = (0:len_y1-1)*(Fs_y1/len_y1);
subplot(5,1,4);
plot(frequency_y1,db_y1);
xlabel('Frequency (Hz)');
ylabel('Magnitude (dB)');
title('y1[n] Magnitude of Fourier Transform');

% for y2
N_z = length(z);
n_z = 0 : N_z-1;
n_z=n_z.';
new_z = ((-1).^n_z).*z;

h=fir1(100,0.5,"low");
h=h.';
h_zeropad = [h; zeros(length(new_z)-length(h), 1)];

y2 = conv(h_zeropad, new_z);
y2_DTFT = fftshift(fft(y2));
magnitude_y2_DTFT = abs(y2_DTFT);
db_y2 = 20*log10(magnitude_y2_DTFT);
len_y2 = length(y2_DTFT);
Fs_y2 = Fs_z;
frequency_y2 = (0:len_y2-1)*(Fs_y2/len_y2);
subplot(5,1,5);
plot(frequency_y2,db_y2);
xlabel('Frequency (Hz)');
ylabel('Magnitude (dB)');
title('y2[n] Magnitude of Fourier Transform');

% sound(x1,Fs_x1); %birds
% sound(x2,Fs_x2); %music
% sound(z,Fs_z);   %birds dominant, music low in the end
% sound(y1,Fs_y1); %birds dominant, music low in the end
% sound(y2,Fs_y2); %only music
% clear sound
```

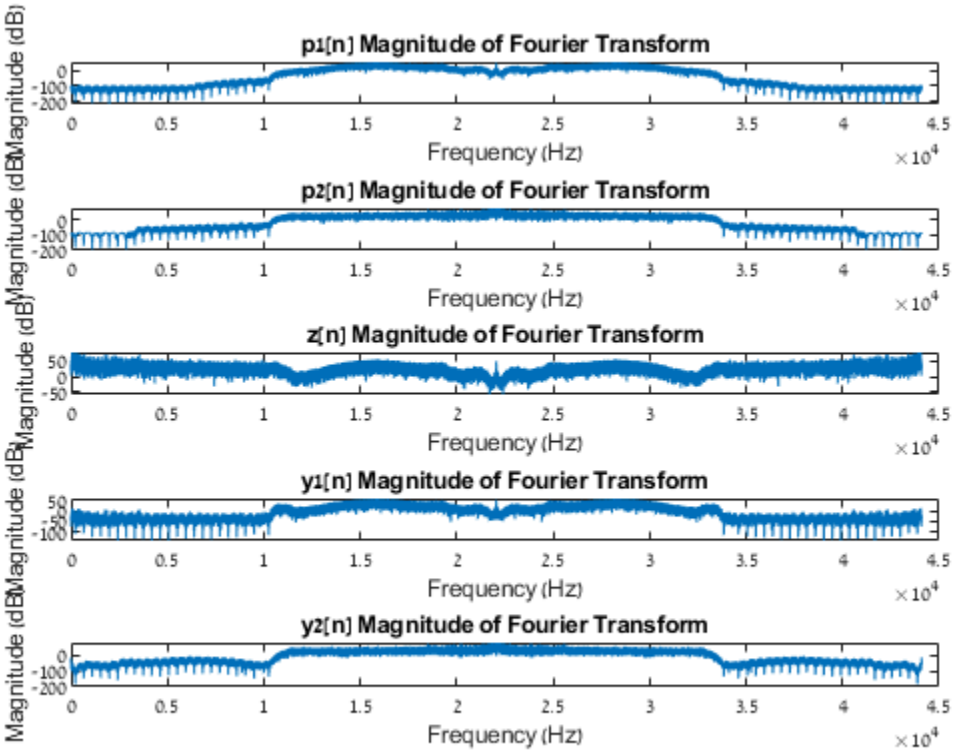


Part 2

```
figure;

h=fir1(100,0.5,"low");
h=h.';
h_zeropad = [h; zeros(length(x1)-length(h), 1)];

p1=conv(x1,h_zeropad);
p1_DTFT=fftshift(fft(p1));
magnitude_p1_DTFT=abs(p1_DTFT);
db_p1=20*log10(magnitude_p1_DTFT);
len_p1 = length(p1_DTFT);
frequency_p1 = (0:len_p1-1)*(Fs_x1/len_p1);
subplot(5,1,1);
plot(frequency_p1,db_p1);
xlabel('Frequency (Hz)');
ylabel('Magnitude (dB)');
title('p1[n] Magnitude of Fourier Transform');

p2=conv(x2,h_zeropad);
p2_DTFT=fftshift(fft(p2));
magnitude_p2_DTFT=abs(p2_DTFT);
db_p2=20*log10(magnitude_p2_DTFT);
len_p2 = length(p2_DTFT);
```

```
frequency_p2 = (0:len_p2-1)*(Fs_x2/len_p2);
subplot(5,1,2);
plot(frequency_p2,db_p2);
xlabel('Frequency (Hz)');
ylabel('Magnitude (dB)');
title('p2[n] Magnitude of Fourier Transform');

p2_len = length(p2);
n_p2 = 0 : p2_len-1;
n_p2=n_p2.';
z = p1 + ((-1).^n_p2).*p2;

z_DTFT=fftshift(fft(z));
magnitude_z_DTFT=abs(z_DTFT);
db_z=20*log10(magnitude_z_DTFT);
len_z = length(z_DTFT);
Fs_z=lcm(Fs_x1, Fs_x2);
frequency_z = (0:len_z-1)*(Fs_z/len_z);
subplot(5,1,3);
plot(frequency_z,db_z);
xlabel('Frequency (Hz)');
ylabel('Magnitude (dB)');
title('z[n] Magnitude of Fourier Transform');

h=fir1(100,0.5,"low");
h=h.';
h_zeropad = [h; zeros(length(z)-length(h), 1)];

y1 = conv(h_zeropad, z);
y1_DTFT = fftshift(fft(y1));
magnitude_y1_DTFT = abs(y1_DTFT);
db_y1 = 20*log10(magnitude_y1_DTFT);
len_y1 = length(y1_DTFT);
Fs_y1 = Fs_z;
frequency_y1 = (0:len_y1-1)*(Fs_y1/len_y1);
subplot(5,1,4);
plot(frequency_y1,db_y1);
xlabel('Frequency (Hz)');
ylabel('Magnitude (dB)');
title('y1[n] Magnitude of Fourier Transform');

N_z = length(z);
n_z = 0 : N_z-1;
n_z=n_z.';
new_z = ((-1).^n_z).*z;

h=fir1(100,0.5,"low");
h=h.';
h_zeropad = [h; zeros(length(new_z)-length(h), 1)];

y2 = conv(h_zeropad, new_z);
y2_DTFT = fftshift(fft(y2));
magnitude_y2_DTFT = abs(y2_DTFT);
db_y2 = 20*log10(magnitude_y2_DTFT);
```

```
len_y2 = length(y2_DTFT);
Fs_y2 = Fs_z;
frequency_y2 = (0:len_y2-1)*(Fs_y2/len_y2);
subplot(5,1,5);
plot(frequency_y2,db_y2);
xlabel('Frequency (Hz)');
ylabel('Magnitude (dB)');
title('y2[n] Magnitude of Fourier Transform');

%sound(p1,Fs_x1)
%sound(x1,Fs_x1)
%sound(y2,Fs_y2)
%sound(y1,Fs_y1)
clear sound
```



Published with MATLAB® R2021b