

FIR FILTERS ANALYSIS

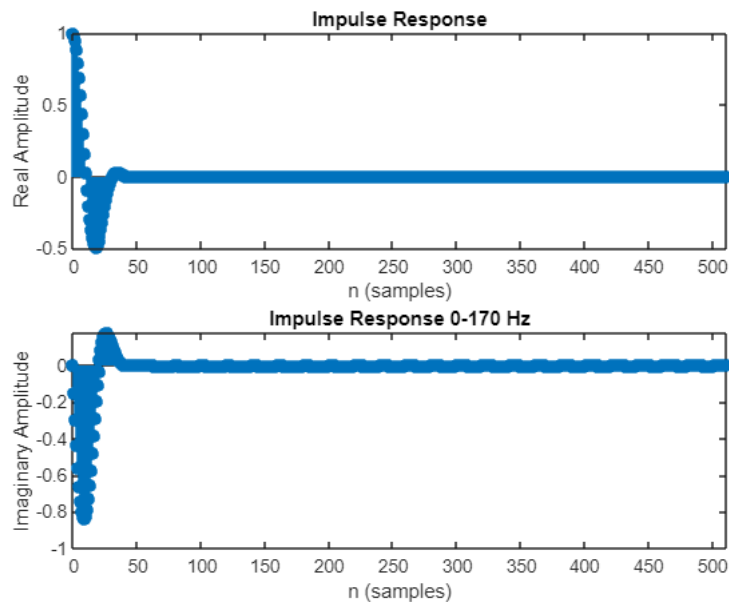
OMAR IBRAHIM 7442

MAZEN NAGY 7475

```

fs = 44100;
Frequencies = [170 300 610 1005 3000 6000 12000 14000 20000];
t = 1/fs;
f = fs/2;
order_fir = 50;
b1 = fir1(order_fir, Frequencies(1)/f);
b2 = fir1(order_fir, [Frequencies(1) Frequencies(2)]/f);
b3 = fir1(order_fir, [Frequencies(2) Frequencies(3)]/f);
b4 = fir1(order_fir, [Frequencies(3) Frequencies(4)]/f);
b5 = fir1(order_fir, [Frequencies(4) Frequencies(5)]/f);
b6 = fir1(order_fir, [Frequencies(5) Frequencies(6)]/f);
b7 = fir1(order_fir, [Frequencies(6) Frequencies(7)]/f);
b8 = fir1(order_fir, [Frequencies(7) Frequencies(8)]/f);
b9 = fir1(order_fir, [Frequencies(8) Frequencies(9)]/f);
[H1 w1] = freqz(b1, 1);
[H2 w2] = freqz(b2, 1);
[H3 w3] = freqz(b3, 1);
[H4 w4] = freqz(b4, 1);
[H5 w5] = freqz(b5, 1);
[H6 w6] = freqz(b6, 1);
[H7 w7] = freqz(b7, 1);
[H8 w8] = freqz(b8, 1);
[H9 w9] = freqz(b9, 1);
%0-170 Hz
figure;
impz(H1);
title('Impulse Response 0-170 Hz');

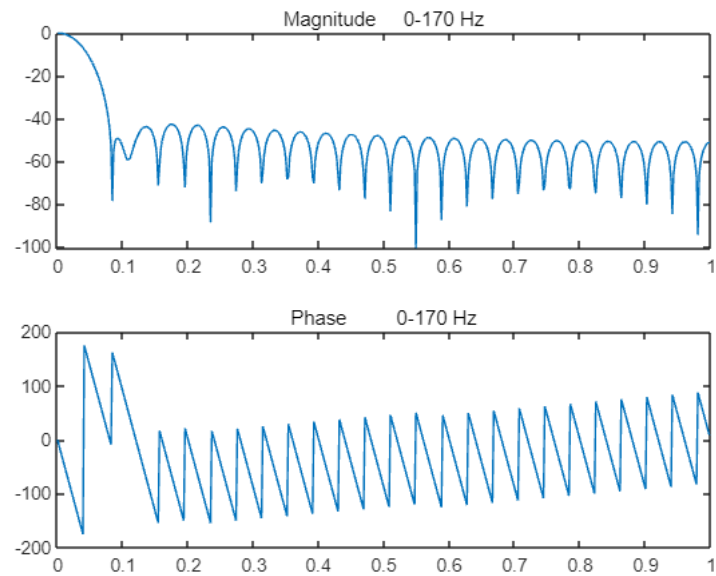
```



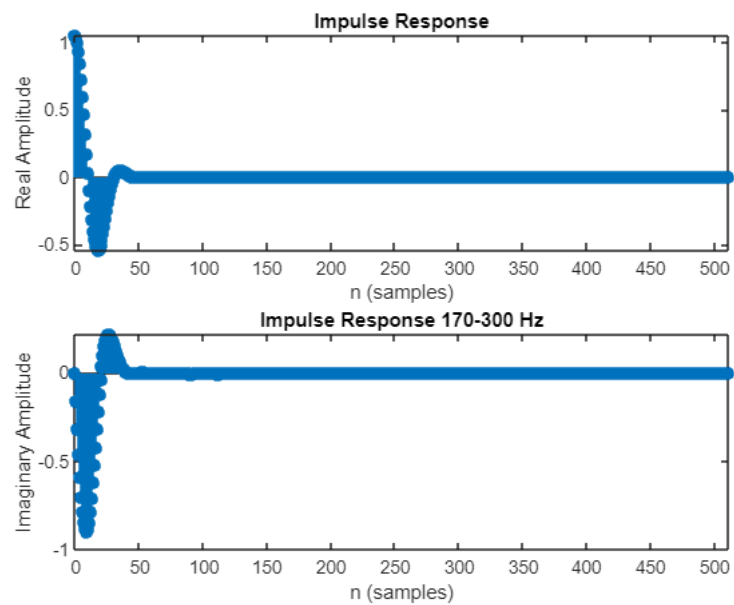
```

figure;
stepz(H1);
title('Step Response 0-170 Hz');

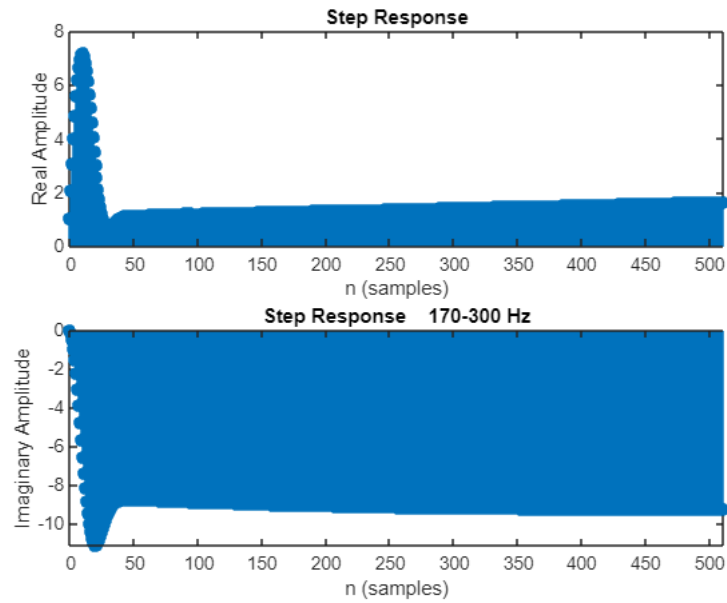
```

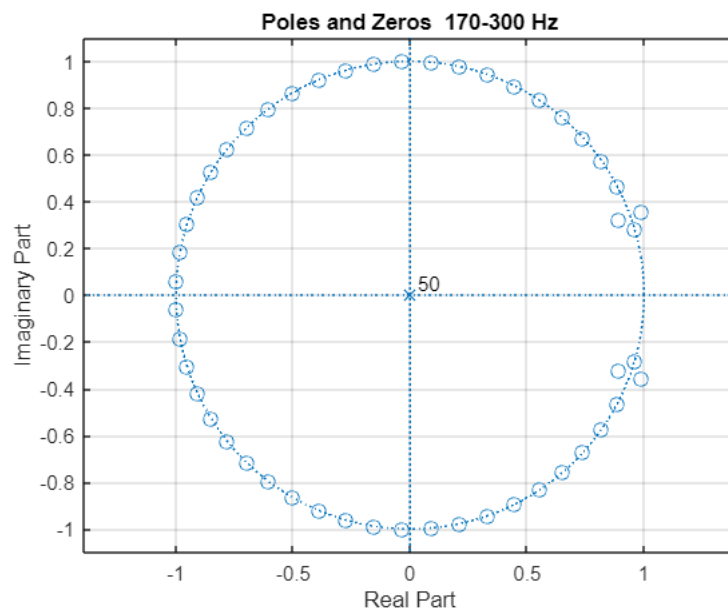
```
%170-300 Hz
figure;
impz(H2);
title('Impulse Response 170-300 Hz');
```



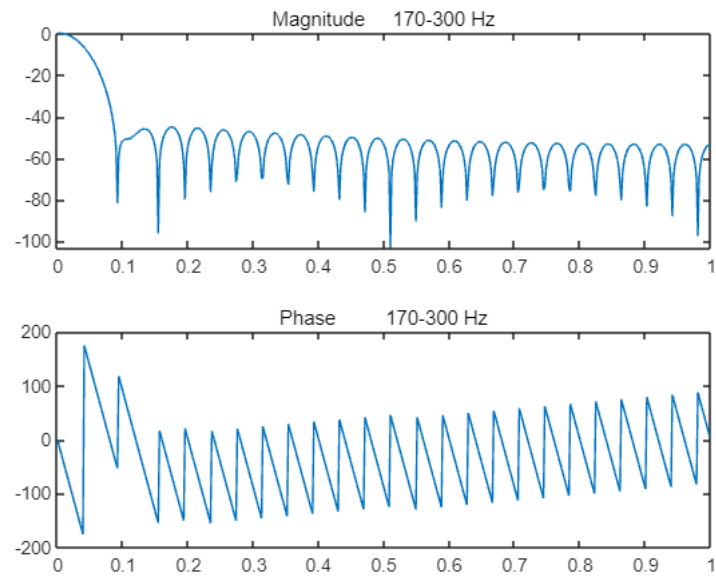
```
figure;
stepz(H2);
title('Step Response 170-300 Hz');
```



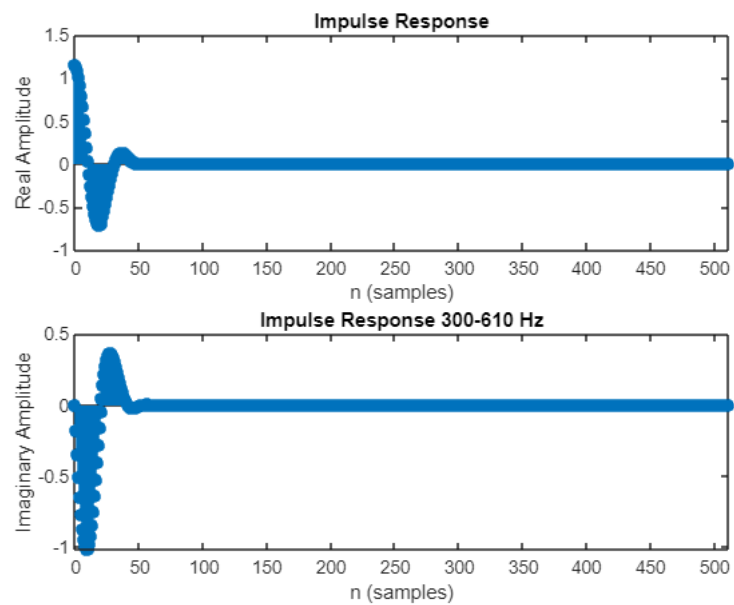
```
figure;
zplane(b2, 1);
grid;
title('Poles and Zeros 170-300 Hz');
```



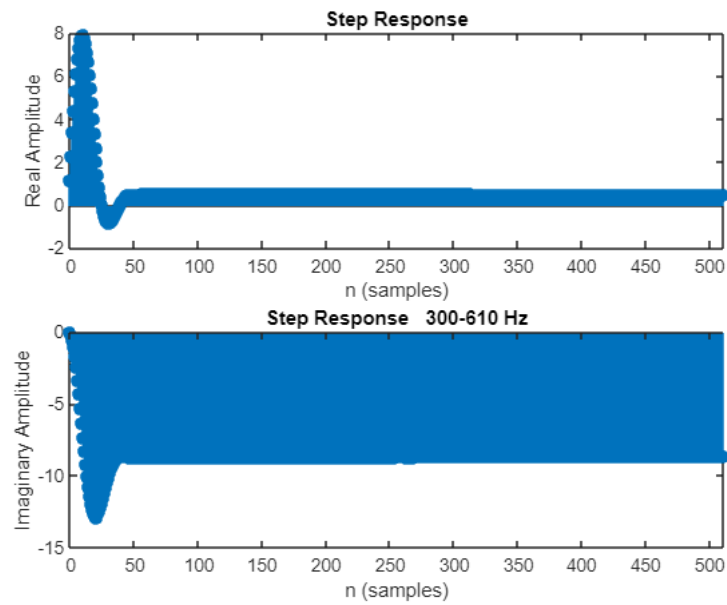
```
figure;
subplot(2, 1, 1);
plot(w1/pi, 20*log10(abs(H2)));
subplot(2, 1, 2);
plot(w1/pi, rad2deg(angle(H2)));
subplot(2, 1, 2);
title('Phase 170-300 Hz');
```



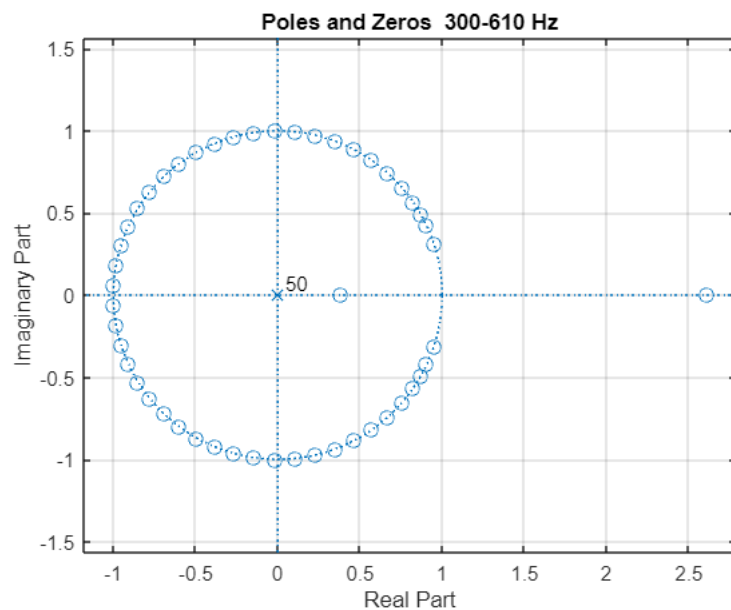
```
%300-610 Hz
figure;
impz(H3);
title('Impulse Response 300-610 Hz');
```



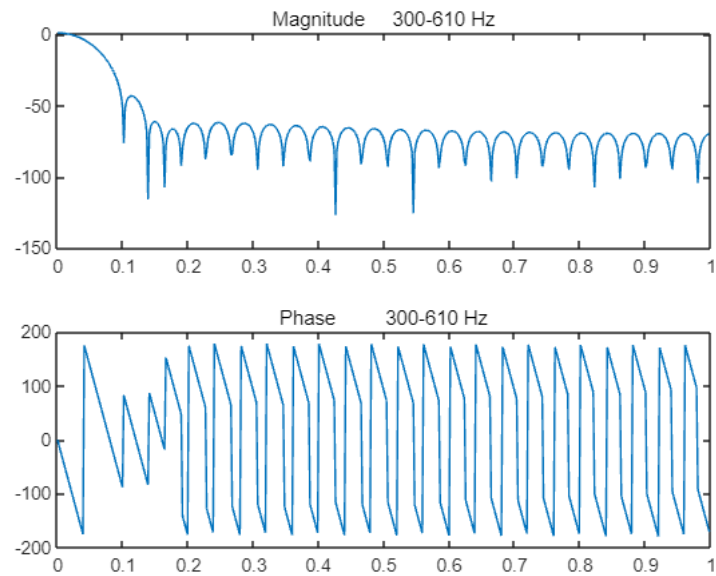
```
figure;
stepz(H3);
title('Step Response 300-610 Hz');
```



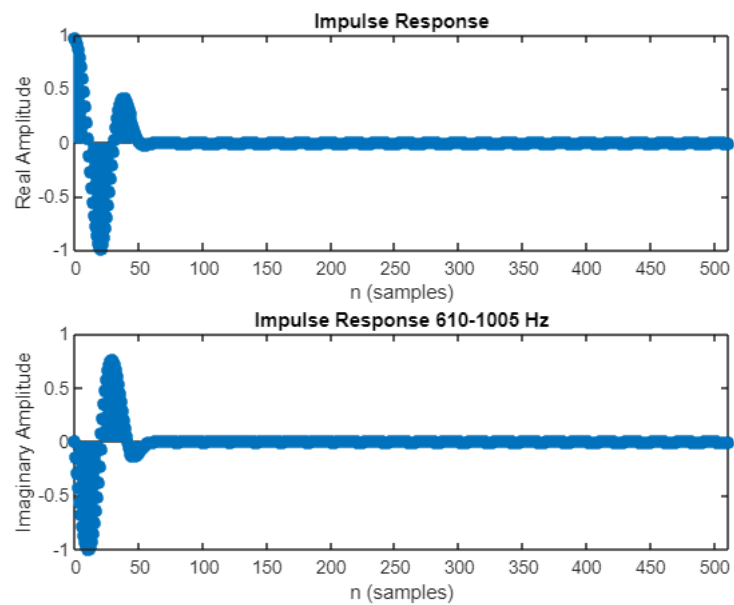
```
figure;  
zplane(b3, 1);  
grid;  
title('Poles and Zeros 300-610 Hz');
```



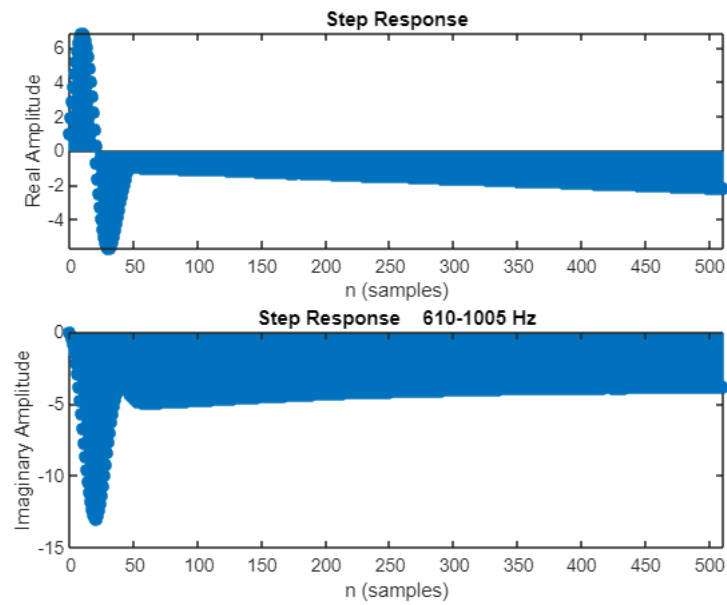
```
figure;
subplot(2, 1, 1);
plot(w1/pi, 20*log10(abs(H3)));
subtitle('Magnitude      300-610 Hz');
subplot(2, 1, 2);
plot(w1/pi, rad2deg(angle(H3)));
subtitle('Phase          300-610 Hz');
```



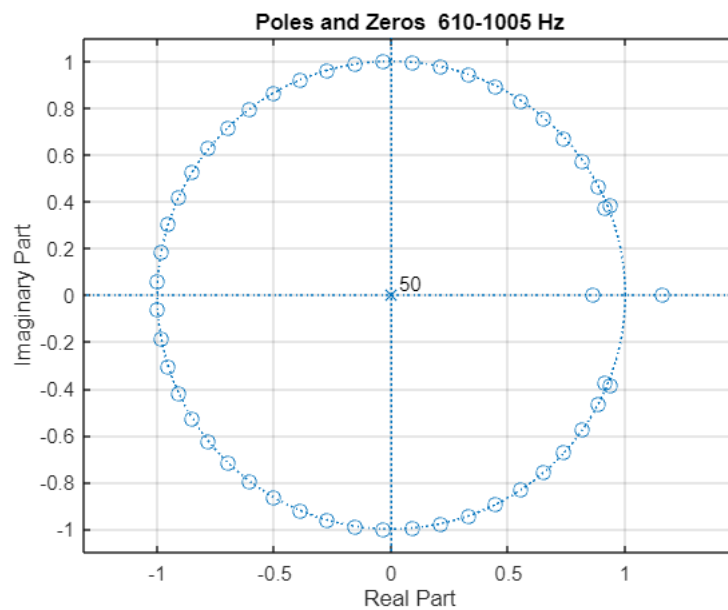
```
%610-1005 Hz
figure;
impz(H4);
title('Impulse Response 610-1005 Hz');
```



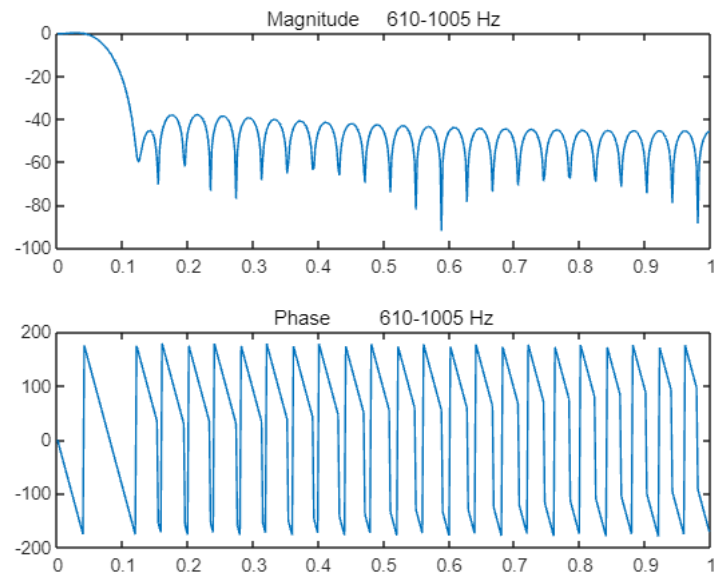
```
figure;
stepz(H4);
title('Step Response 610-1005 Hz');
```

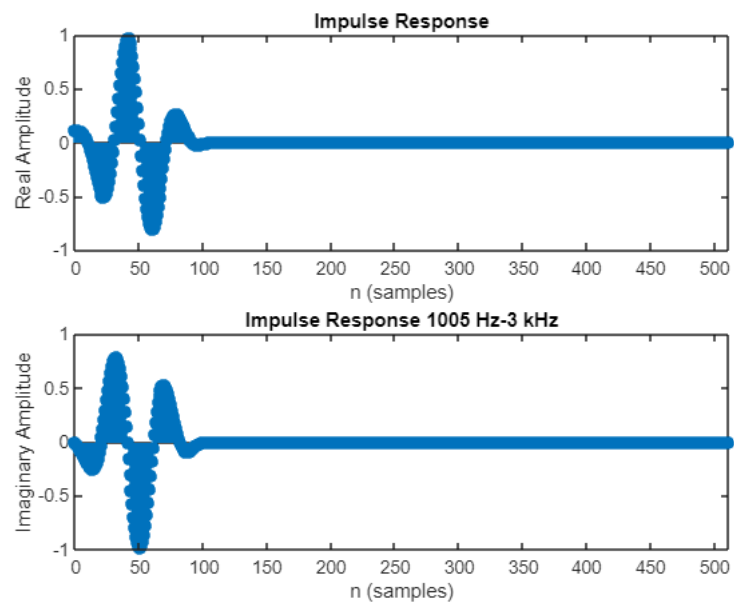
```
figure;
zplane(b4, 1);
grid;
title('Poles and Zeros 610-1005 Hz');
```



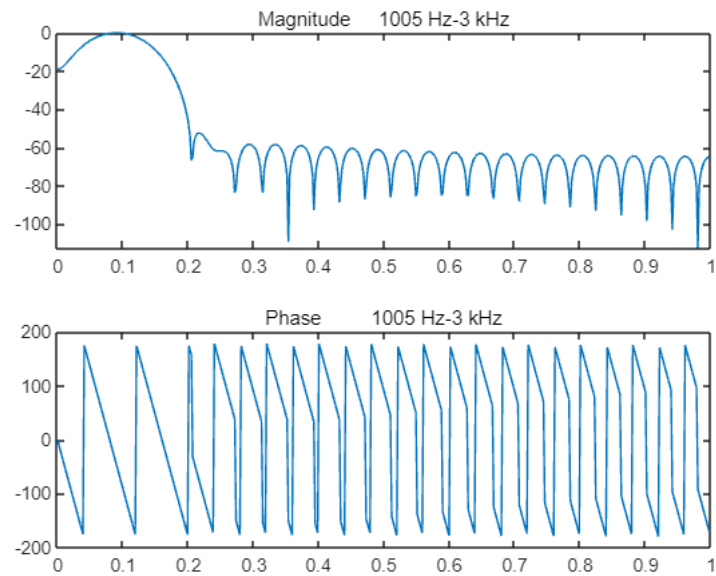
```
figure;
subplot(2, 1, 1);
plot(w1/pi, 20*log10(abs(H4)));
subplot(2, 1, 2);
plot(w1/pi, rad2deg(angle(H4)));
subplot(2, 1, 2);
title('Phase 610-1005 Hz');
```



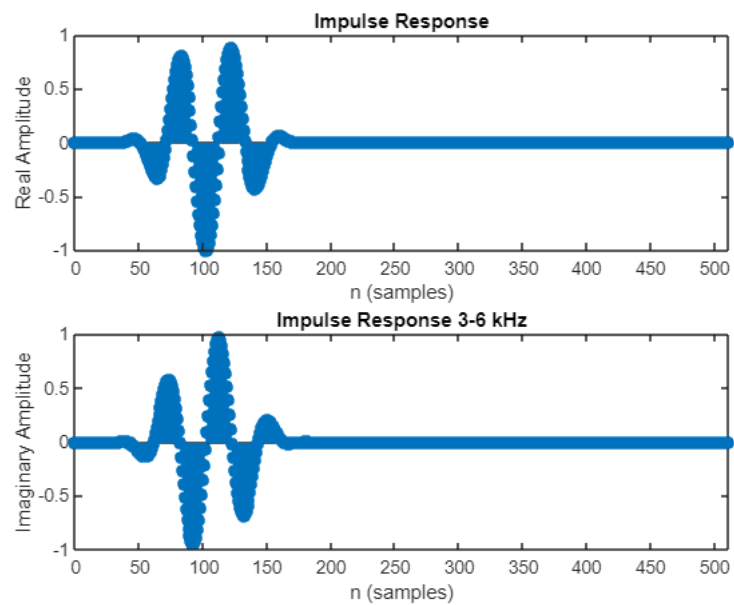
```
%1005 Hz-3 kHz
figure;
impz(H5);
title('Impulse Response 1005 Hz-3 kHz');
```



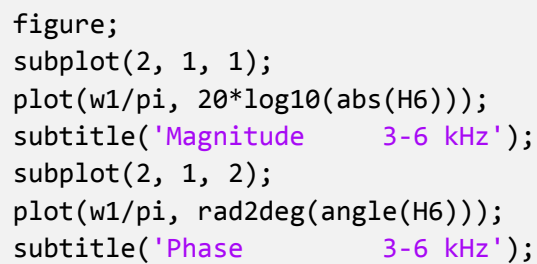
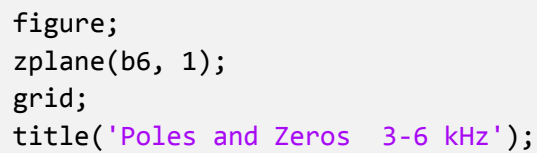
```
figure;
stepz(H5);
title('Step Response 1005 Hz-3 kHz');
```

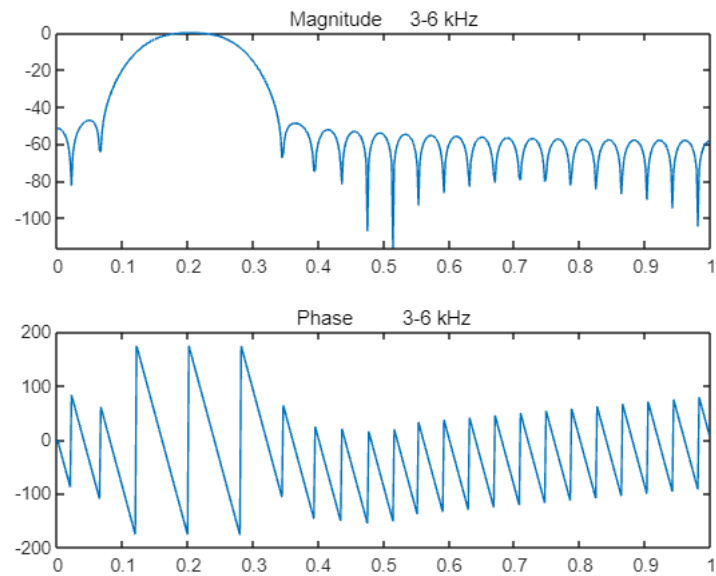



```
%3-6 kHz
figure;
impz(H6);
title('Impulse Response 3-6 kHz');
```

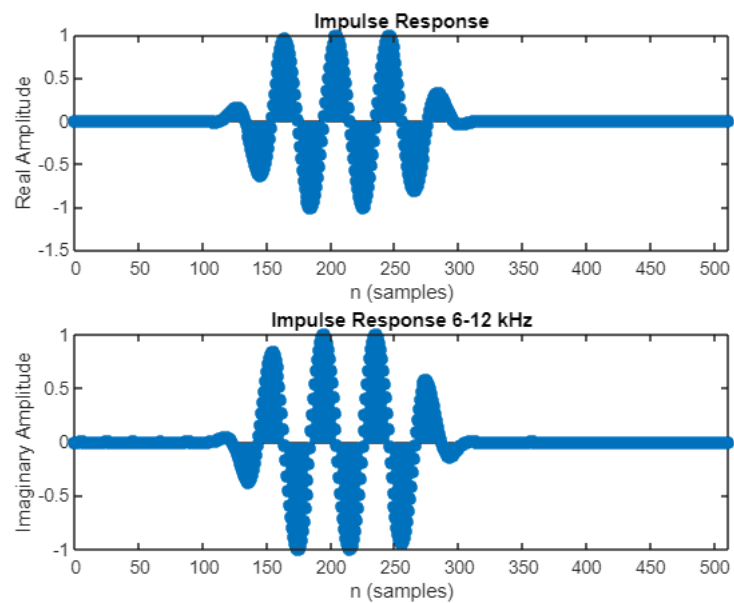


```
figure;
stepz(H6);
title('Step Response 3-6 kHz');
```

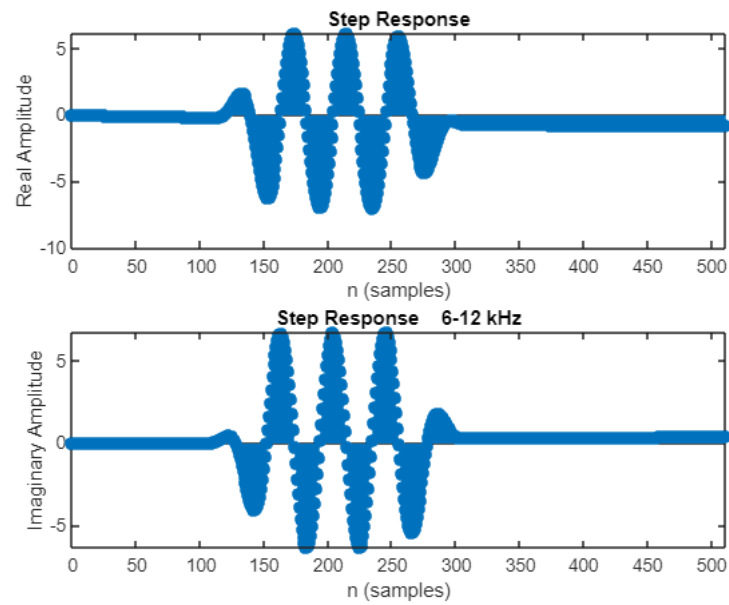




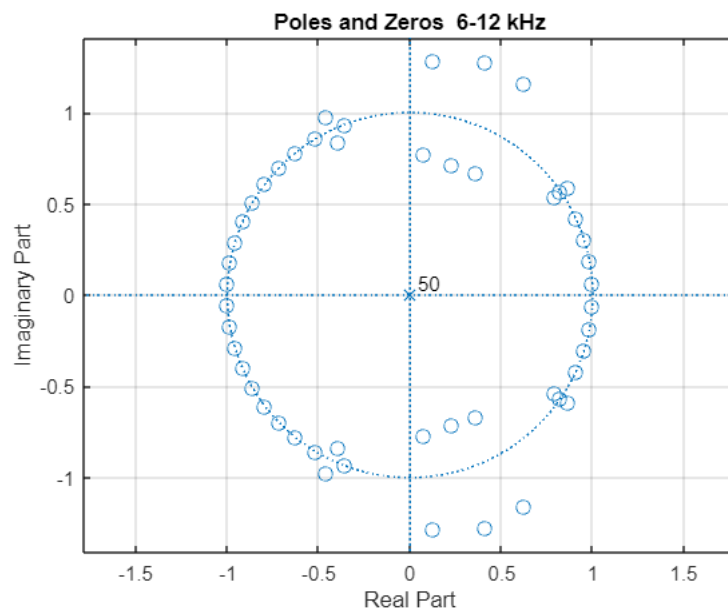
```
%6-12 kHz
figure;
impz(H7);
title('Impulse Response 6-12 kHz');
```



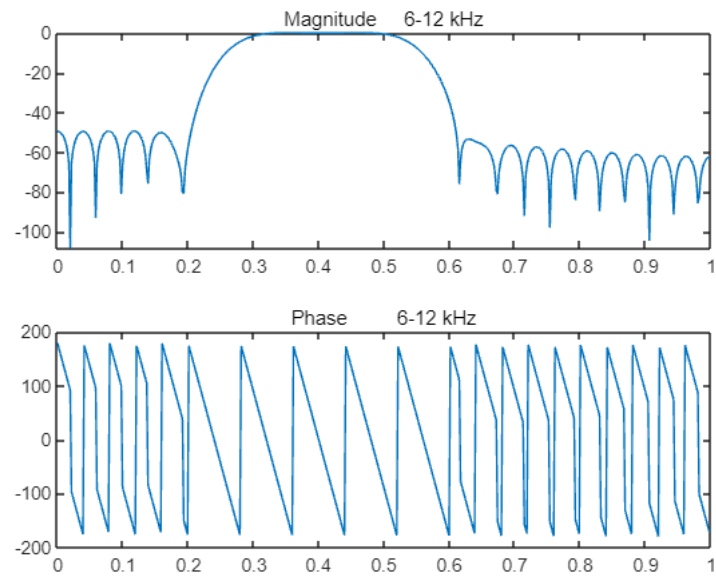
```
figure;
stepz(H7);
title('Step Response 6-12 kHz');
```



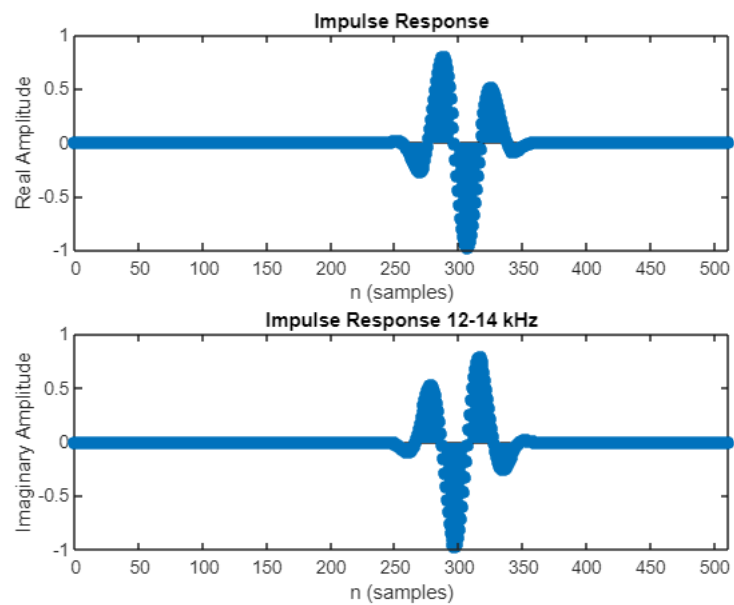
```
figure;
zplane(b7, 1);
grid;
title('Poles and Zeros 6-12 kHz');
```



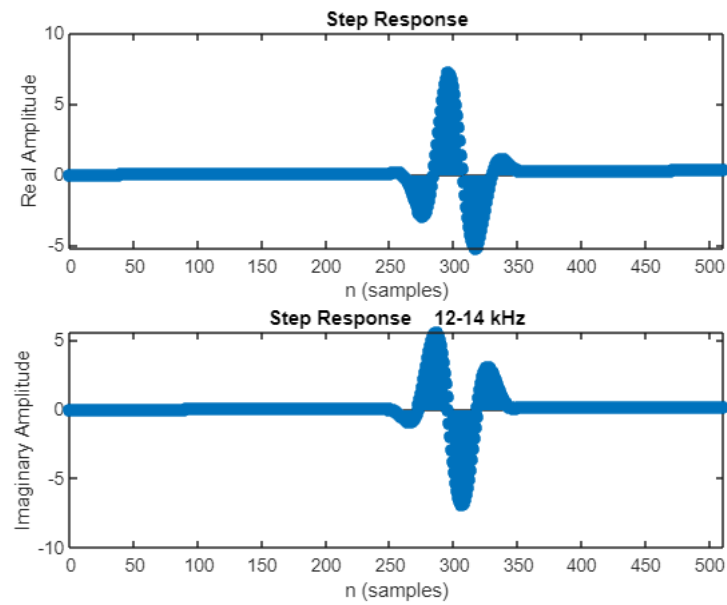
```
figure;
subplot(2, 1, 1);
plot(w1/pi, 20*log10(abs(H7)));
subtitle('Magnitude 6-12 kHz');
subplot(2, 1, 2);
plot(w1/pi, rad2deg(angle(H7)));
subtitle('Phase 6-12 kHz');
```



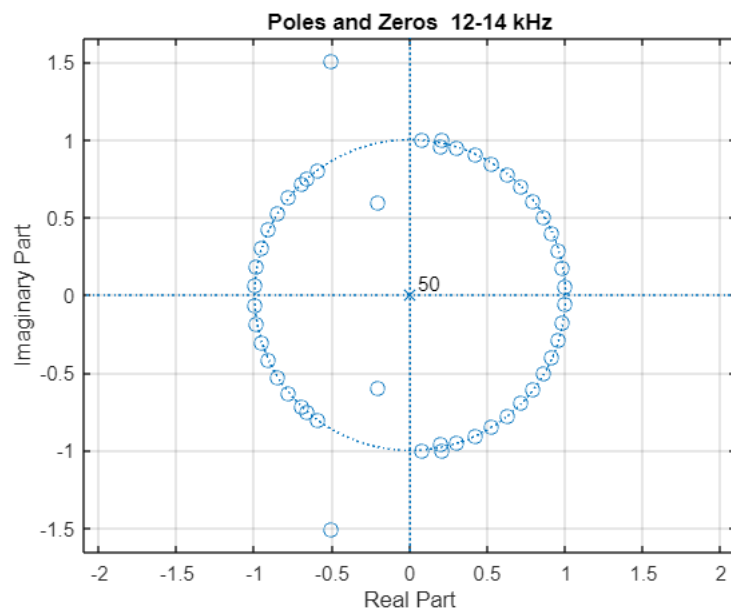
```
%12-14 kHz
figure;
impz(H8);
title('Impulse Response 12-14 kHz');
```



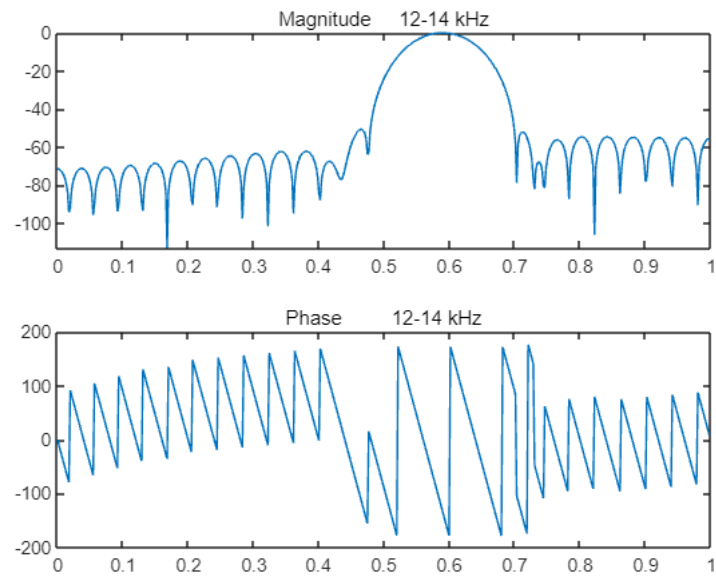
```
figure;
stepz(H8);
title('Step Response 12-14 kHz');
```

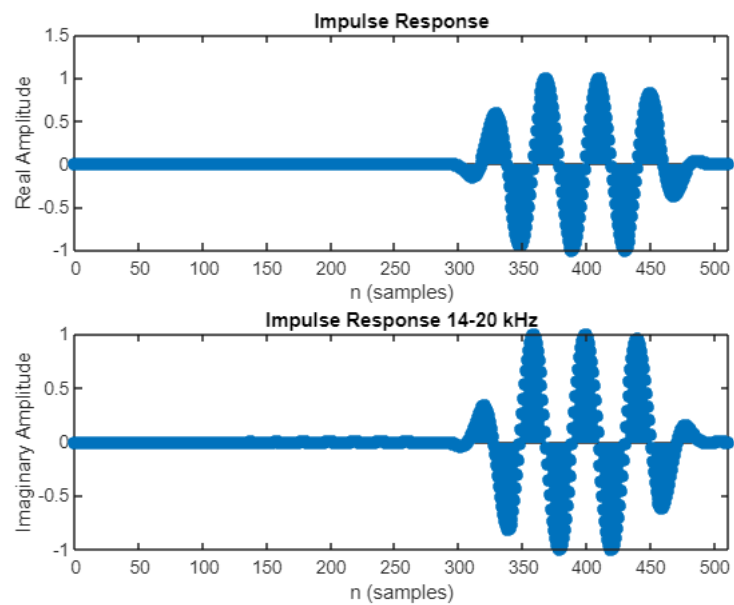
```
figure;  
zplane(b8, 1);  
grid;  
title('Poles and Zeros 12-14 kHz');
```



```
figure;  
subplot(2, 1, 1);  
plot(w1/pi, 20*log10(abs(H8)));  
subtitle('Magnitude 12-14 kHz');  
subplot(2, 1, 2);  
plot(w1/pi, rad2deg(angle(H8)));  
subtitle('Phase 12-14 kHz');
```



```
%14-20 kHz
figure;
impz(H9);
title('Impulse Response 14-20 kHz');
```



```
figure;
stepz(H9);
title('Step Response 14-20 kHz');
```