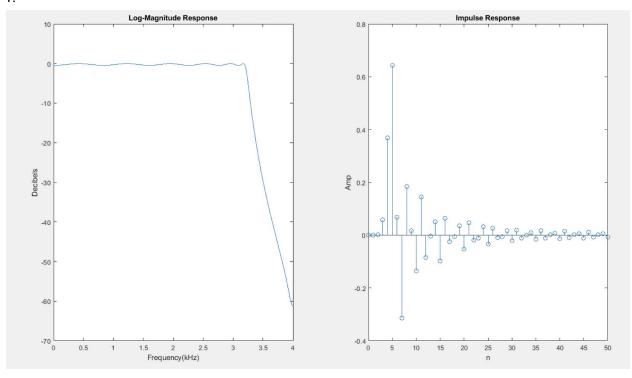
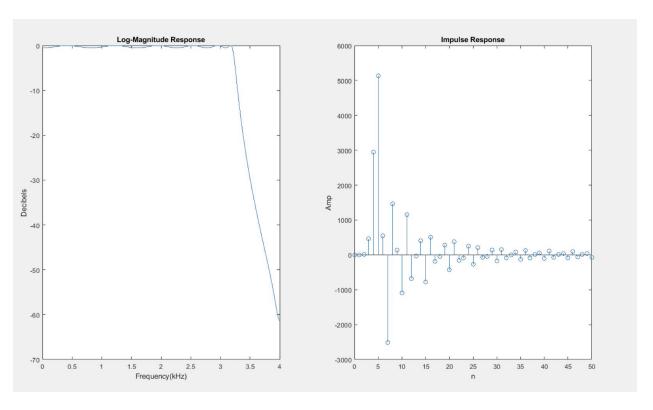
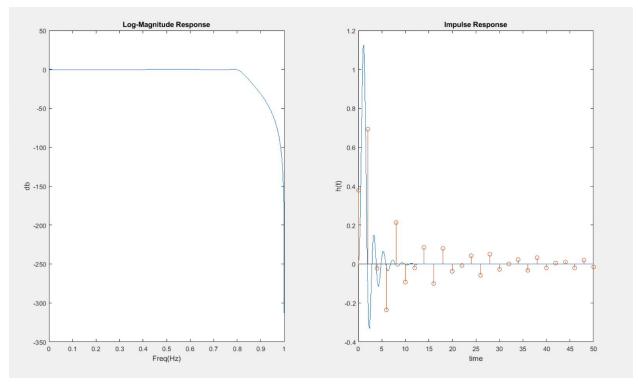
Jeremy Liem HW 7 EE 442

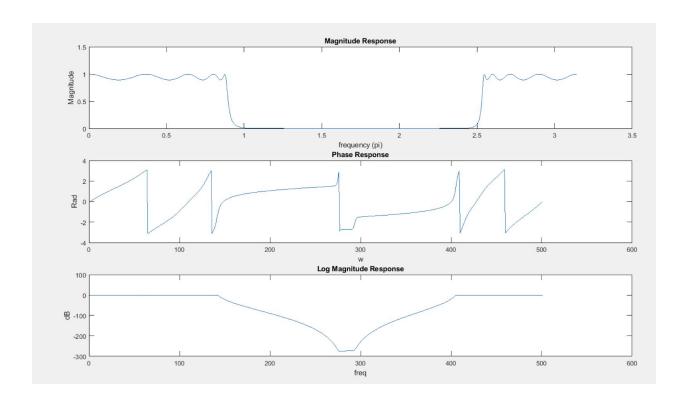




(3) Part 1 and 2 has same Log-Magnitude response. However, they have different impulse response and they differ by an expected scale.

2.





4.	$P_1 = -3$ $P_2 = -5$ $Z_1 = -8$
T	P, =-3
	P2=-5 Z1=-8
	Z1=-8 (45) (45) (45) (45) (45) (45) (45)
	H(s)= St8
	(5+3)(s+5)
	= 1(4)4 (4)11 (2) = (4)2 (3)
	$\frac{1 + 13}{5+3} = \frac{5}{5+3} + \frac{-3}{5+5}$
	St3 St5 St3 + St5
	a) Impulse Invariance.
	Contraction SE tourselond SE TOUR
	5/
	$\frac{\sqrt{5}}{1 - e^{-37}z^{-1}} = \frac{3/2}{1 - e^{-57}z^{-1}} = \frac{1}{10}$
	1-e-37z-1 +e-37z-1 10
N. Committee	
	$\frac{1-e^{-0.3}}{1-e^{-0.3}} = \frac{3}{1-e^{-0.5}}$
	1-e-0.3 2-1 1-0.5 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
	H(s): $\frac{5+8}{(s+3)(s+5)}$ = $\frac{1}{4} + \frac{1}{1} = \frac{5}{2} + \frac{3}{4} = \frac{3}$
	b) Bilinear Transform
	0 2 1-2-1
	S> 2 1-2-1 T 1+2-1
1	1112
	2,
	H(2) = 3/2
	201-2-1+3 201-2-1+5
	1+2-1 1+2-175
1	
	$\frac{1-(2)-\frac{1}{2}-\frac{7}{2}}{20\frac{1-2^{-1}}{1+2^{-1}}+3} = \frac{72}{20\frac{1-2^{-1}}{1+2^{-1}}+5}$
	6

Code

```
%% Number 8.21(1);
                                                     %% Number 8.21(2)
Fsa = 8000;
                                                     Fsa = 8000;
Fp = 3200;
                                                     Fp = 3200;
Rp = 0.5;
                                                     Rp = 0.5;
Fs = 3800;
                                                     Fs = 3800;
As = 45;
                                                     As = 45;
wp = 2*pi*Fp/Fsa;
                                                     wp = 2*pi*Fp/Fsa;
ws = 2*pi*Fs/Fsa;
                                                     ws = 2*pi*Fs/Fsa;
                                                     T = 1/8000;
T = 1;
omP = wp/T;
                                                     omP = wp/T;
omS = ws/T;
                                                     omS = ws/T;
[cs, ds] = afd_chb1(omP,omS,Rp,As);
                                                     [cs, ds] = afd_chb1(omP,omS,Rp,As);
[b,a] = imp_invr(cs,ds,T);
                                                     [b,a] = imp_invr(cs,ds,T);
[C,B,A] = dir2par(b,a);
                                                     [C,B,A] = dir2par(b,a);
[db,mag,pha,grd,w] = freqz_m(b,a);
                                                     [db,mag,pha,grd,w] = freqz_m(b,a);
[h,n] = impz(b,a,51);
                                                     [h,n] = impz(b,a,51);
figure;
                                                     figure;
subplot(1,2,1);
                                                     subplot(1,2,1);
plot(w/(2*pi)*Fsa/1000,db);
                                                     plot(w/(2*pi)*Fsa/1000,db);
title('Log-Magnitude Response');
                                                     title('Log-Magnitude Response');
xlabel('Frequency(kHz)');
                                                     xlabel('Frequency(kHz)');
ylabel('Decibels');
                                                     ylabel('Decibels');
subplot(1,2,2);
                                                     subplot(1,2,2);
stem(n,h);
                                                     stem(n,h);
title('Impulse Response');
                                                     title('Impulse Response');
xlabel('n');
                                                     xlabel('n');
                                                     ylabel('Amp');
ylabel('Amp');
2.
%8.31
                                                     [ha,x,t] = impulse(cs,ds,t);
Fsa = 8000;
                                                     [x,n] = impseq(0,0,N);
Fp = 3200;
                                                     h = filter(b,a,x);
Rp = 0.5;
Fs = 3800;
\mathsf{As} = 45;
                                                     figure;
wp = 2*pi*Fp/Fsa;
                                                     subplot(1,2,1);
ws = 2*pi*Fs/Fsa;
                                                     plot(w/pi,db);
T = 2;
                                                     title('Log-Magnitude Response');
omP = (2/T)*tan(wp/2);
                                                     xlabel('Freq(Hz)');
omS = (2/T)*tan(ws/2);
                                                     ylabel('db');
[cs, ds] = afd_chb1(omP,omS,Rp,As);
[b,a] = bilinear(cs,ds,1/T);
                                                     subplot(1,2,2);
[db,mag,pha,grd,w] = freqz_m(b,a);
                                                     plot(t,ha);
N = 25;
                                                     title('Impulse Response');
t = 0:T/10:T*N;
                                                     xlabel('time');
```

```
hold on;
ylabel('h(t)');
                                                    stem(n*T,h);
3.
w1p = 0.2*pi;
w1s = 0.3*pi;
w2s = 0.7*pi;
w2p = 0.8*pi;
T=1;
W1p = (2/T)*tan(w1p/2);
W1s = (2/T)*tan(w1s/2);
W2s = (2/T)*tan(w2s/2);
W2p = (2/T)*tan(w2p/2);
w0 = (W1s + W2s)/2;
bw = W2p - W1p;
Rp = 1; As = 50;
[N, Wc] = cheb1ord([0.2 0.8], [0.3 0.7], Rp, As, 's');
[Z, P, K] = cheb1ap(N, Rp);
[num,den] = zp2tf(Z,P,K);
[numt, dent] = lp2bs(num, den, w0, bw);
[nt, dt] = bilinear(numt, dent, 1);
[db,mag,pha,grd,w] = freqz_m(nt,dt);
figure;
subplot(3,1,1); plot(w, mag);
title('Magnitude Response');
xlabel('frequency (pi)'); ylabel('Magnitude');
subplot(3,1,2); plot(pha);
title('Phase Response');
xlabel('w'); ylabel('Rad')
subplot(3,1,3); plot(db);
title('Log Magnitude Response'); xlabel('freq');
ylabel('dB');
```