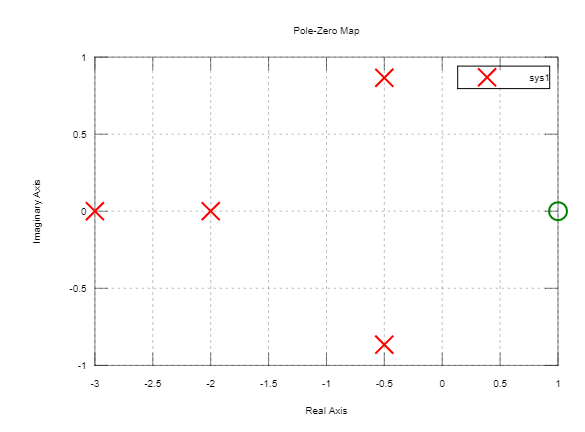
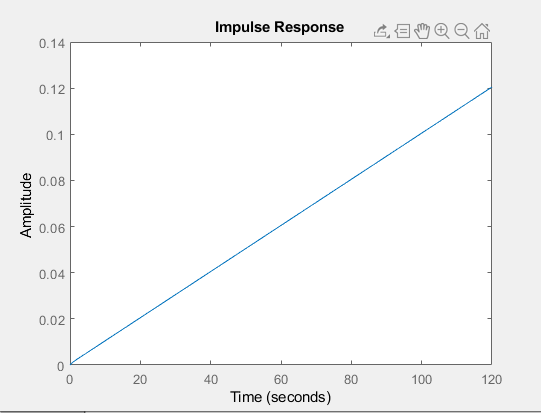
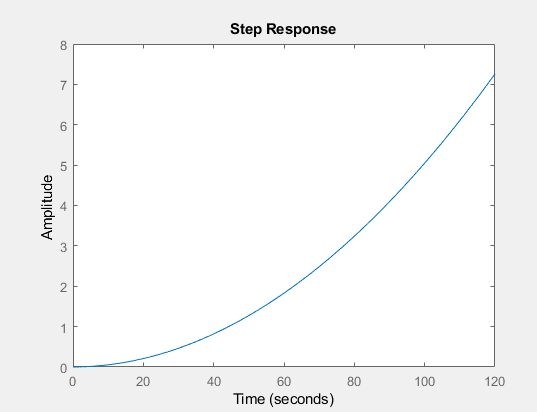
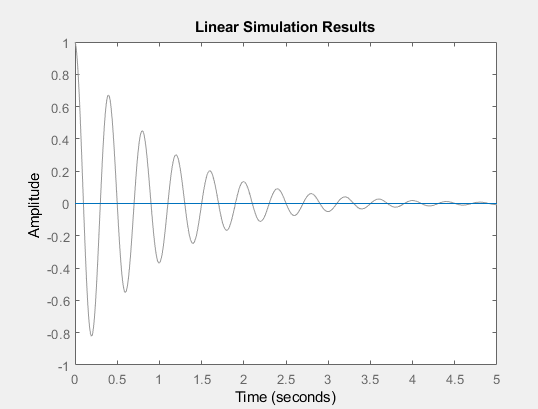
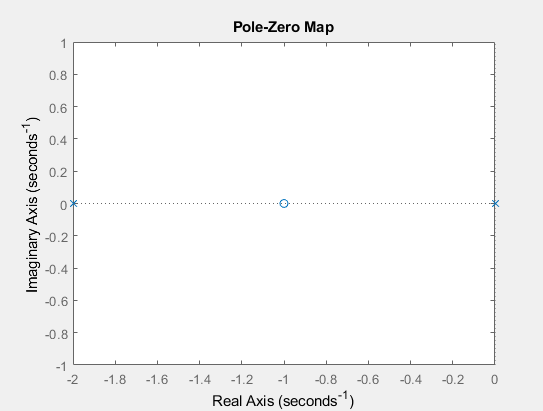
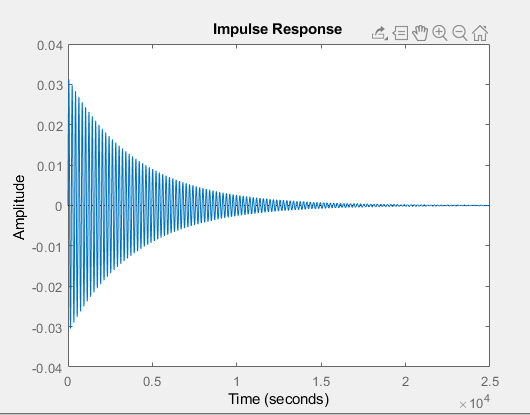
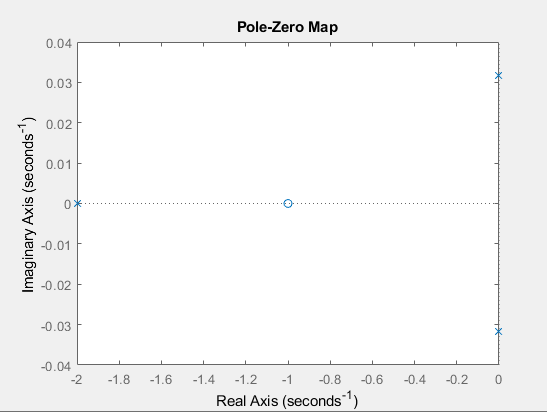
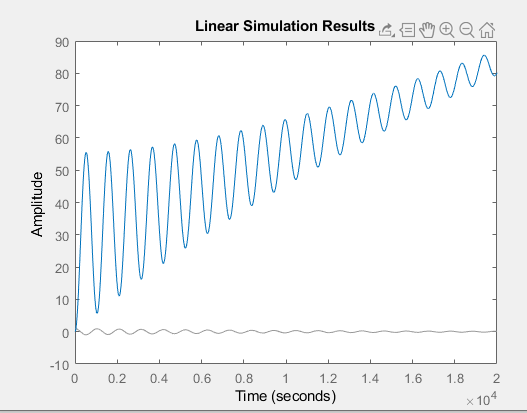
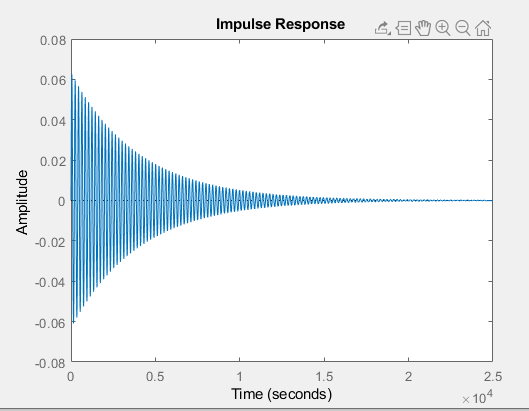
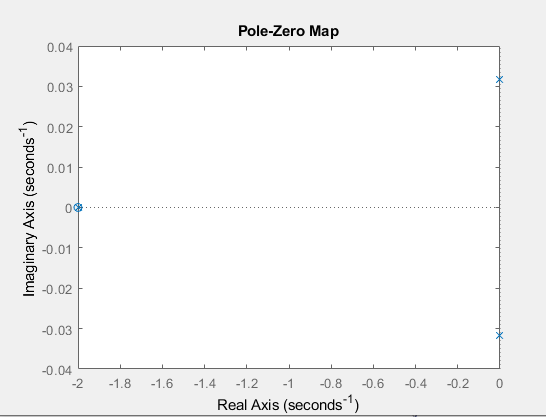
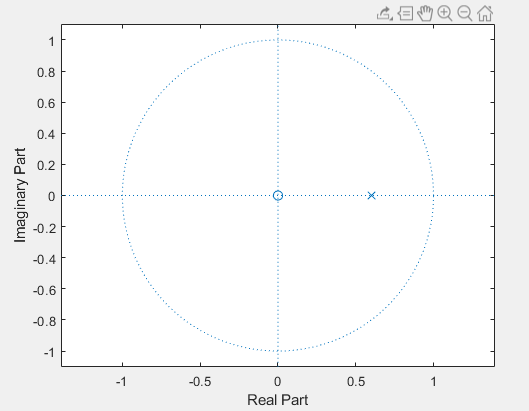
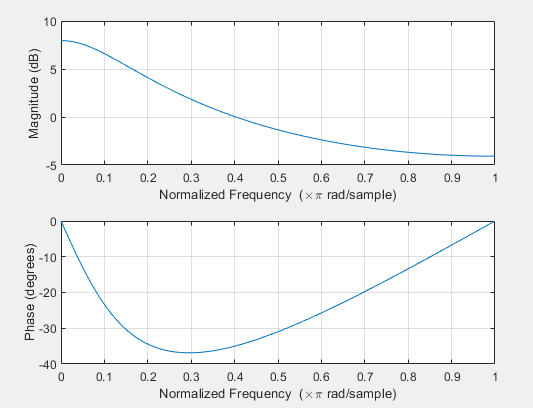
Ashcon Abae

Signals and Systems

23 November 2019

Project 2

1. **Problem 4.33 in Textbook (all parts)**  
   Given:  
   1. Let’s take the Fourier Transform on both sides of this equation:  
      We then get:  
      We can use the Matlab reside function to perform a partial fraction expansion:  
      Finally, we take Inverse Fourier Transform of above expression:  
        
      >> n = [2]  
      >> d = [-1 6 8]  
      >> rpk = residue(n, d)  
        
      r =  
      1.0000  
      1.0000  
        
      p =  
      -2.0000  
      -4.0000  
        
      k =  
      []
   2. Given:  
      Taking the Fourier Transform of x(t):From part a), we know  
      We can use the Matlab residue function to perform a partial fraction expansion:  
      Finally, we take the Inverse Fourier Transform of the above expression:  
      >> n = [2]  
      >> d = [1 1 1 1 18]  
      >> rpk = residue(n, d)  
        
      r =  
      0.2500  
      -0.5000  
      1.0000  
      0.2500  
        
      p =  
      -2.0000  
      -4.0000  
      -8.0000  
      -4.0000  
        
      k =  
      []
   3. Let’s take the Fourier Transform of the given differential equation:  
      We can use the Matlab residue function to perform a partial fraction expansion:  
      Finally, we take the Inverse Fourier Transform of the above expression:
2. **Problem 4.34 in Textbook (part b)**
3. Given the frequency response of LTI system S:  
   We can split the denominator above into 2 factors:  
   We can use the Matlab residue to perform a partial fraction expansion:  
   Finally, we take the Inverse Fourier Transform of the above expression:
4. **Problem 9.22 in Textbook (part e)**
5. >> n=[1 1]; %n=s+1  
   >> d=[1 5 6]; %d=s^2(s+2)=s^2+5s+6  
   >> [r p k]=residue(n d);  
     
   r =  
   2  
   -1  
     
   p =  
   -3  
   -2  
     
   k =  
   []  
     
   This shows us that our partial fraction expansion is:  
   Next, we take the inverse Laplace transform:  
     
   >>syms s t  
   >> F = 2/(s+3) – 1/(s+2);  
   >> ilaplace(F, t)  
     
   answer =
6. **Problem 9.7 in Textbook**>> n=[1 -1];  
   >> d=[1 6 12 11 6];  
   >> sys1=tf(n,d)  
   >> pzmap(sys1)  
     
     
   1. >> n1 = [1 1]  
      >> d1 = [1 2]  
      >> G1 = tf(n1, d1)  
        
      >> n2 = [1]  
      >> d2 = [500 0 0]  
      >> G2 = tf(n2, d2)  
        
      >> G3 = G1\*G2 %forward path transfer function  
        
      >> [n d] = series(n1, d1, n2, d2)  
      >> printsys(n, d)  
      >> sys = tf(n, d)
   2. >> impulse(G3) %plots impulse response of G(s) found in part a  
        
      
   3. >> step(sys)  
      
   4. >> T=0:0.002:5;  
      >> U=cos(15.7\*T) .\* exp(-T);  
      >> lsim(sys, U, T)  
        
      
   5. >> [p z] = pzmap(G3) %since all poles lie on left side of s-plane, system is stable  
        
      p =  
      0  
      0  
      -2  
        
      z =  
      -1
   6. pzmap(G3)  
      
   7. >> n1 = [1 1]  
      >> d1 = [1 2]  
      >> G1 = tf(n1, d1)  
        
      >> n2 = [1]  
      >> d2 = [500 0 0]  
      >> G2 = tf(n2, d2)  
        
      >> G3 = G1\*G2 %forward path transfer function  
      >> G = feedback(G3, 1) % closed loop transfer function with % gain of feedback path = unity
   8. >> [n d] = series(n1, d1, n2, d2)  
      >> printsys(n, d)  
      >> sys = tf(n, d)
   9. >> impulse(G) %plots impulse response of G(s) found in part a  
        
        
      Adding feedback to this system reduces the overall gain of the system with the degree of reduction being related to the systems open-loop gain.
   10. >> [p z] = pzmap(G) %since all poles lie on left side of s-plane, system is stable  
         
       p =  
       -1.9995 + 0.0000i  
       -0.0002 + 0.0316i  
       -0.0002 - 0.0316i  
         
       z =  
       -1
   11. >> pzmap(G)  
       
   12. >> T=0:10:20000;  
       >> U=cos(0.006\*T) .\* exp(-T/10000);  
         
       
7. 1. >> n1 = [1]  
      >> d1 = [500 0 0]  
      >> G1 = tf(n1, d1)  
        
      >> n2 = [1 1]  
      >> d2 = [1 2]  
      >> H1 = tf(n2, d2)  
        
      >> G = feedback(G1, H1)
   2. >> [n d] = series(n1, d1, n2, d2)  
      >> printsys(n, d)  
      >> sys=tf(n, d)
   3. >> impulse(G) %plots impulse response of G(s) found in part a  
        
      
   4. >> [p z] = pzmap(G) %since all poles lie on left side of s-plane, system is stable  
        
      p =  
      -1.9995 + 0.0000i  
      -0.0002 + 0.0316i  
      -0.0002 - 0.0316i  
        
      z =  
      -2
   5. >>pzmap(G)  
        
      
   6. Given:  
      Taking Z transform in above difference equation:  
      zplane(n, d)  
        
        
        
      Because the pole lies inside the unit circle, the system is stable.
   7. >> freqz(n, d, 1024)  
        
      
   8. >> impz(n, d)  
        
      