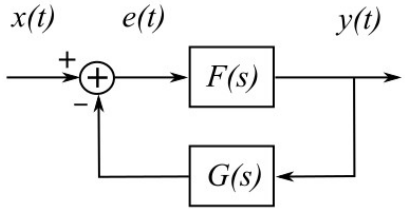
ELE314 Linear Systems and Signals Exam #2 Summer 2017 Name:

Open book/notes (10 questions, 10 points each)

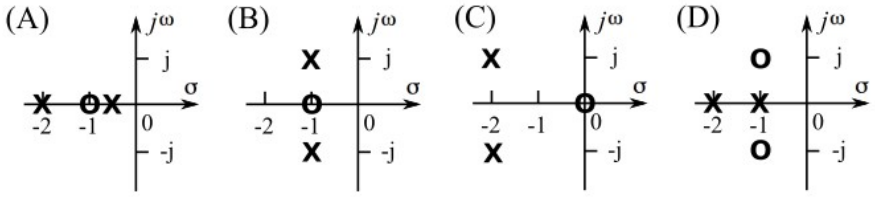
1. ( ) The figure on the right shows a negative feedback configuration of two continuous-time LTI systems with the individual transfer functions: $F(s)=\frac{1}{s+1}$, and $G(s)=\frac{1}{s+1}$.



What is the overall transfer function *H(s)*? (A) $\frac{s+1}{s^2+2s+2}$,

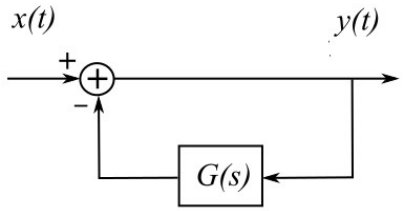
(B) $\frac{s}{s^2+2s+1}$, (C) $\frac{1}{s^2+2s+2}$, (D) $\frac{s+1}{s^2+2s+1}$, (E) none of the above.

2. ( ) For the above problem, what is the pole-zero plot of the overall system?



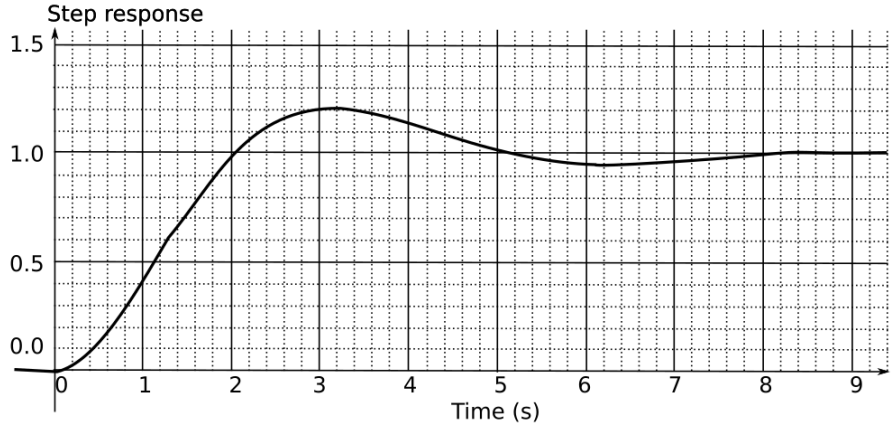
(E) none of the above.

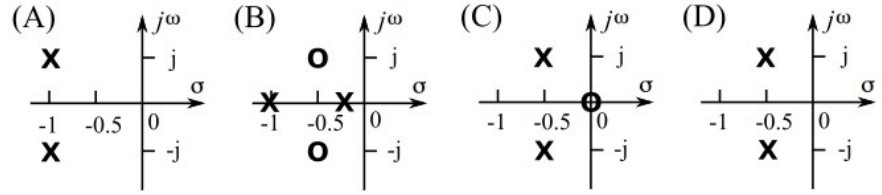
3. ( ) The figure on the right shows a negative feedback system with *F(s)* = 1. If we want the overall transfer function *H(s)* to be $\frac{s+1}{s+2}$, what should *G(s)* be? (A) $\frac{s}{s+1}$, (B) $\frac{s}{s+2}$,



(C) $\frac{1}{s+1}$, (D) $\frac{1}{s+2}$, (E) none of the above.

4. ( ) The step response of a 2nd-order continuous-time LTI system is shown below. Which of the following is its pole-zero plot?



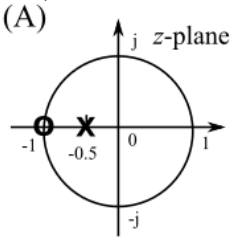


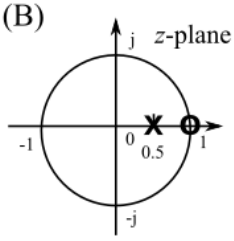
(E) none of the above.

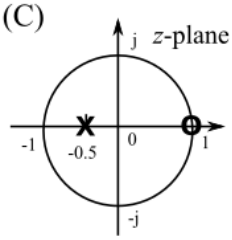
5. ( ) The filter equation for a digital filter is given by $y[n]=\frac{1}{4}x[n]-\frac{1}{4}x[n-1]-\frac{1}{2}y[n-1]$.

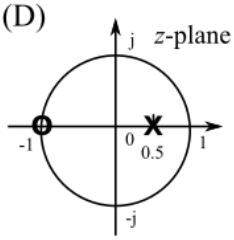
What is its transfer function *H(z)*? (A) $\frac{z-1}{4z+2}$, (B) $\frac{z+1}{4z-2}$, (C) $\frac{z-2}{4z+1}$, (D) $\frac{z+4}{2z+1}$, (E) none of the above.

6. ( ) For the above problem, what is its pole-zero plot?

(A) 

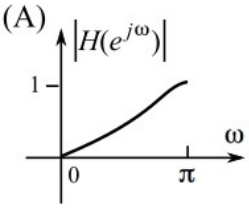
(B) 

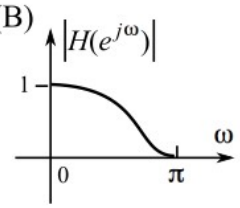
(C) 

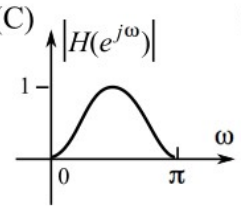
(D) 

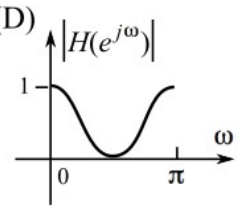
(E) none of the above.

7. ( ) For the above problem, what does its $|H(e^{j\omega})|$ look like?

(A) 

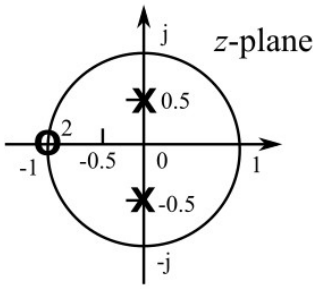
(B) 

(C) 

(D) 

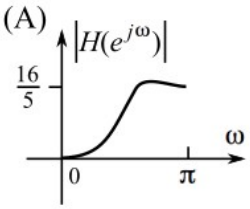
(E) none of the above.

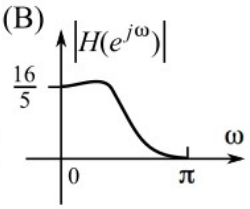
8. ( ) The pole-zero plot of a digital filter on the right shows two poles at ±0.5*j* and a double zero at -1. What is its *H(z)*? (A) $\frac{z^2+1}{z^2+0.5}$, (B) $\frac{z^2-2z+1}{z^2-0.25}$, (C) $\frac{z^2+0.25}{z^2-2z+1}$, (D) $\frac{z^2+2z+1}{z^2+0.25}$, (E) none of the above.

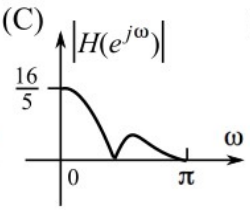


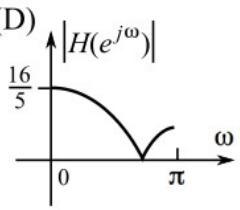
9. ( ) For the above problem, what is the filter equation?
(A) $y[n]=x[n]+x[n-2]+0.25\,y[n-2]$,
(B) $y[n]=x[n]-2\,x[n-1]+x[n-2]+0.25\,y[n-2]$,
(C) $y[n]=x[n]+0.25\,x[n-2]+y[n-1]-y[n-2]$,
(D) $y[n]=x[n]+2\,x[n-1]+x[n-2]-0.25\,y[n-2]$, (E) none of the above.

10. ( ) For the above problem, what does its $|H(e^{j\omega})|$ look like?

(A) 

(B) 

(C) 

(D) 

(E) none of the above.