信號與系統 Signals and Systems

Mat-Lab HW4

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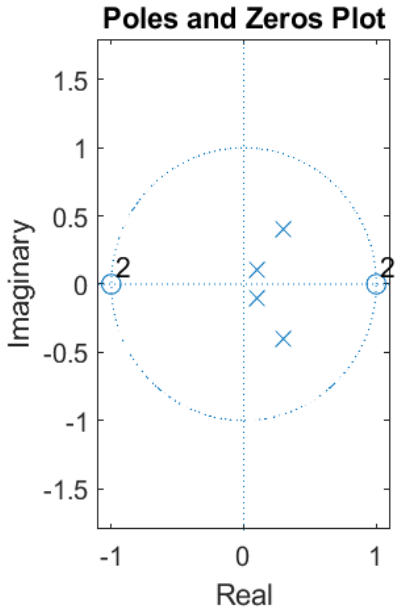
Questions

(a)

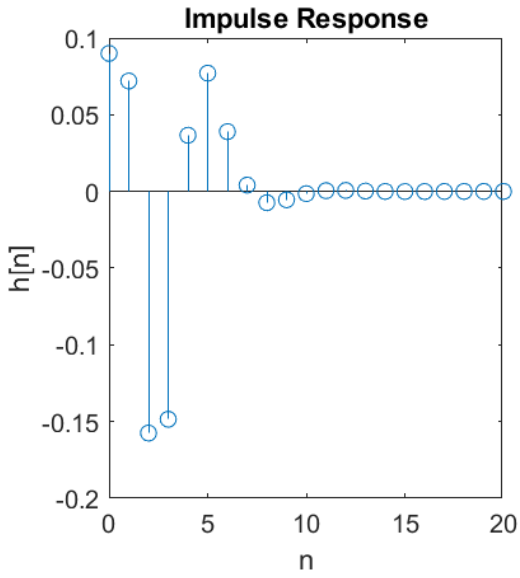


Zeros: -2, +2

Poles: 0.1+j, 0.1-j, 0.3+0.4j, 0.3-0.4j

The ROC of H(z): |z|>0.5 (causal and stable system)

(b)



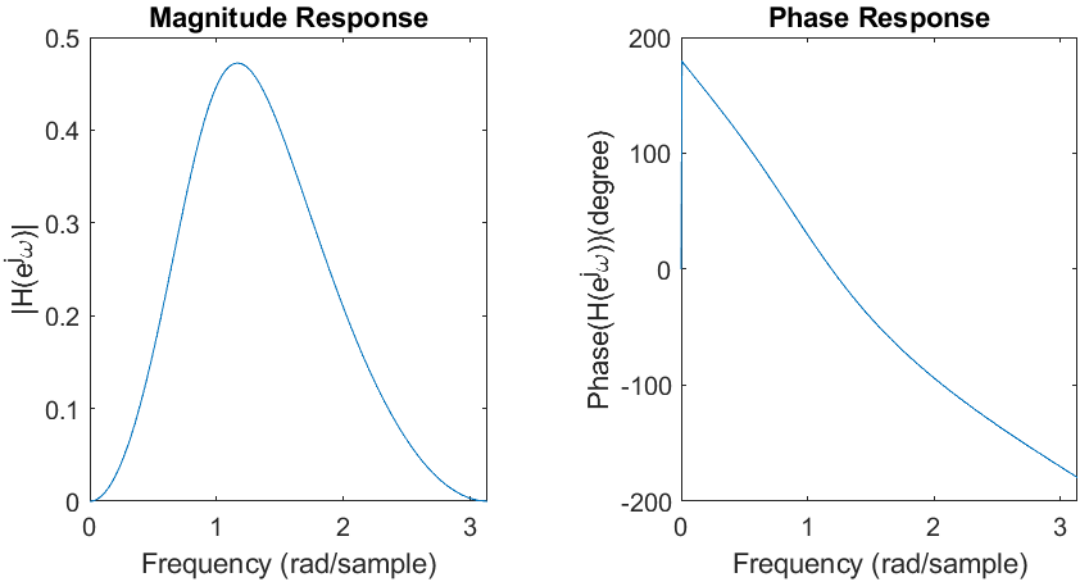
Meaning of r and p: After the partial fraction expansion, the coefficient vectors of the following terms:

$$\frac{r(i)}{(1-p(i)z^{-1})} \xrightarrow{Z^{-1}} r(i)\cdot p(i)^{n}u[n]$$

Meaning of k: the coefficients of the nonpositive power series of z

$$k(1)+k(2)z^{-1}+k(3)z^{-2}+\cdots \xrightarrow{Z^{-1}} k(i)\delta[n+1-i]$$

(c)



When $z = e^{i\omega}$, the magnitude and phase of transfer function H

(d)

sos matrix:

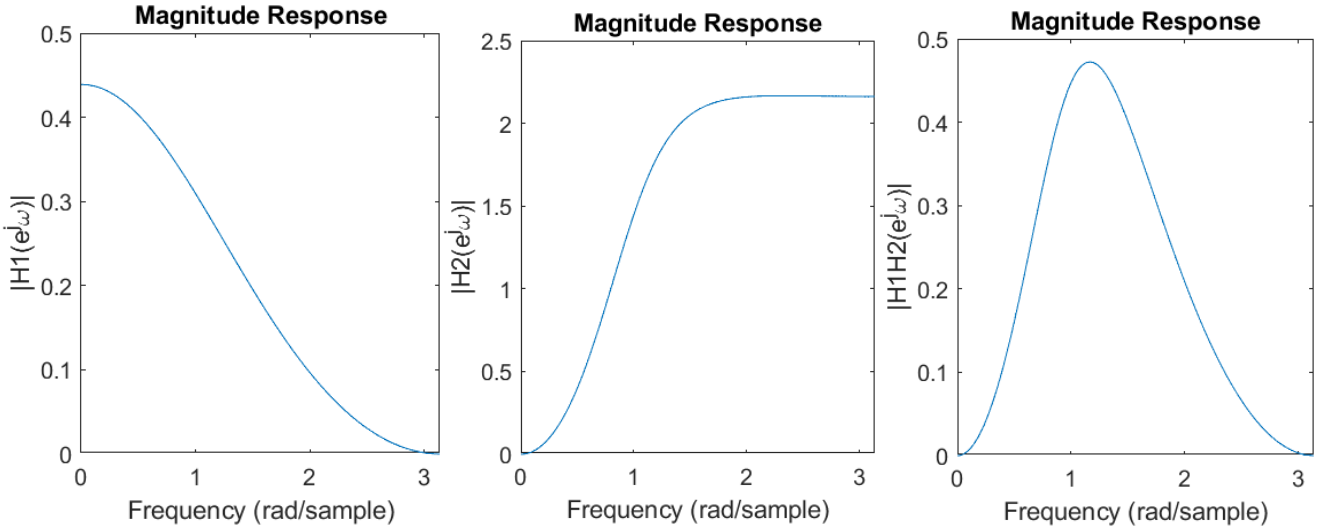
```
Second-Order Sections:
    0.0900    0.1800    0.0900    1.0000   -0.2000    0.0200
    1.0000   -2.0000    1.0000    1.0000   -0.6000    0.2500
```

$$H(z) = H_1(z)H_2(z)$$

$$H_1(z) = \frac{0.09 + 0.18z^{-1} + 0.09z^{-2}}{1 - 0.2z^{-1} + 0.02z^{-2}}$$

$$H_2(z) = \frac{1 - 2z^{-1} + z^{-2}}{1 - 0.6z^{-1} + 0.25z^{-2}}$$

(e)



By observation, the magnitude of H1H2 is the same as that of H in (c)

###

Actually, there is slight difference, but by the verifying code, I determine that they are almost the same.

Code: (88-102) , take the acceptable error as 10^-15

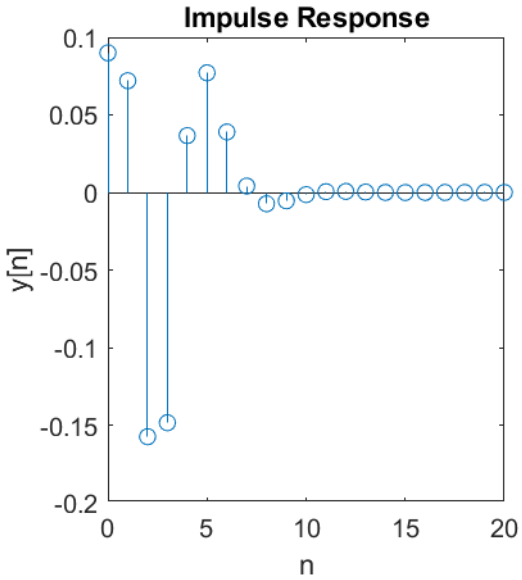
```
88      correct = true;
89      i = 1;
90      for err = abs(mag-mag_)
91          if err > 10^-15
92              disp('there is difference');
93              correct = false;
94              i = i + 1;
95              disp(i);
96              disp(err);
97          end
98      end
99
100     if correct
101         disp('answer in e is the same as answer in c')
102     end
```

Result:

```
answer in e is the same as answer in c
>>
```

###

(f)



By observation, the impulse response y[n] is the same as h[n] in (b)

###

Actually, there is slight difference, but by the verifying code, I determine that they are almost the same.

Code: (114-128) , take the acceptable error as 10^-14

```
correct_ = true;
i = 1;
for err_ = abs(h_n-y)
    if err_ > 10^-14
        disp('there is difference');
        correct_ = false;
        i = i + 1;
        disp(i);
        disp(err_);
    end
end

if correct_
    disp('answer in f is the same as answer in b')
end
```

Result:

```
answer in f is the same as answer in b
fx >>
```