Digital Signal Processing
MATLAB HW - q4

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Clear recent data

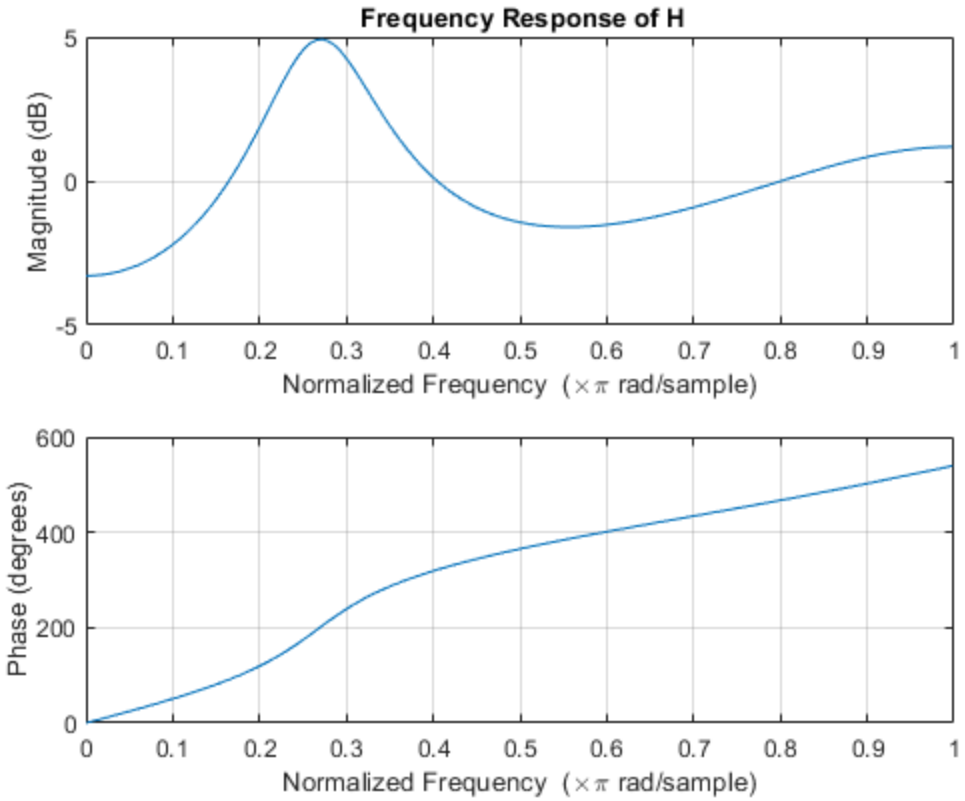
```
clear; close all; clc;
```

defining variables for part A

```
c = -2*sqrt(2) ;
a = [1 c 4]; %denominator
b = [4 c 1]; %numerator
```

Plot the frequency response of the system :

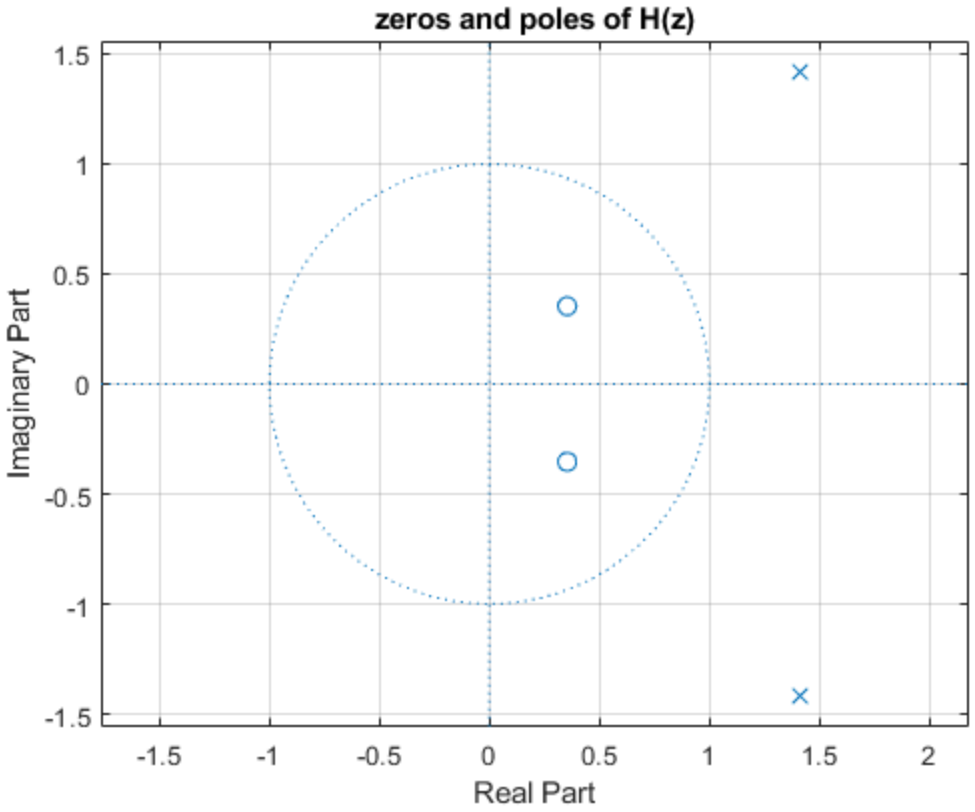
```
figure(1)
freqz(b , [1 a] ) %using freqz command
title(" Frequency Response of H");
```



Part B : Plot the poles and zeros of H(z)

```
[b,a] = eqtflength(b,a);
[z,p,k] = tf2zp(b,a);
figure(2)
zplane(z,p)
grid
title("zeros and poles of H(z)");
display("Because system is stable , ROC must include |z| = 1 so ROC is
 |z| <1.99 ")
```

```
   "Because system is stable , ROC must include |z| = 1 so ROC is |z|
 <1.99 "
```



part C : finding h(n) and s(n)

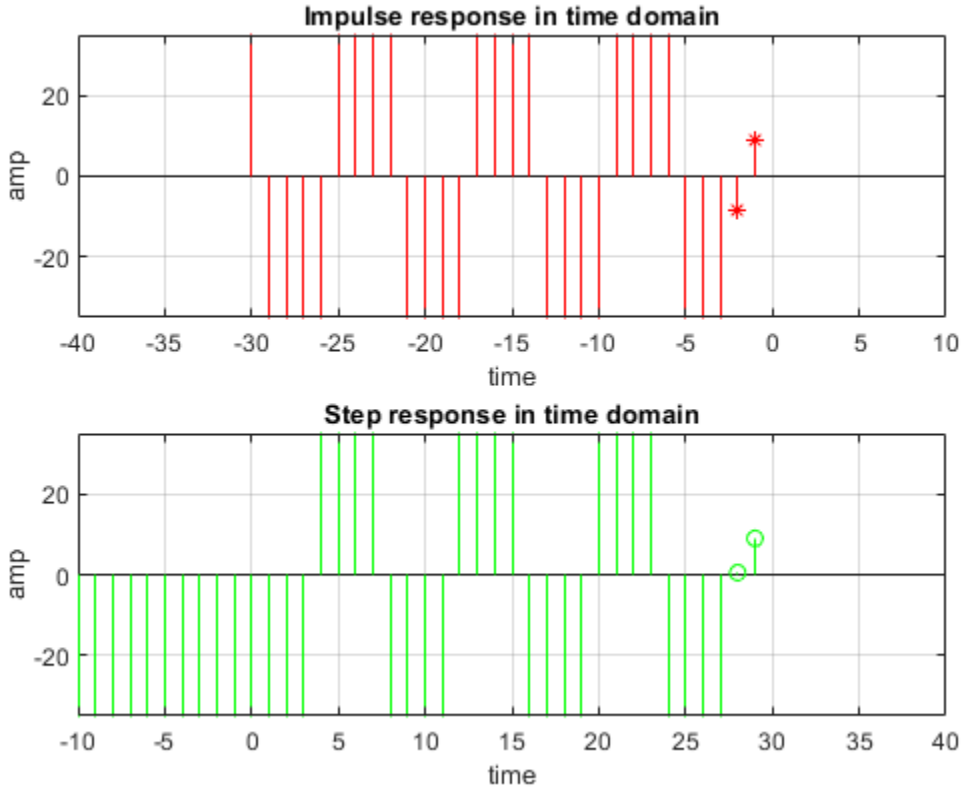
```
[r,p,k1] = residue(b,a) ;
% now We have numerators and denominators and poles
r = r';
p = p'; % we make them row matrix
n1 = -30 : 1 : -1 ;
h = r(1).*((p(1)).^-n1) + r(2).*((p(2)).^-n1);  %% we define h[n]
 using pfe and residue command
u = stepseq(0,-5,24); %u(n)
s = conv(h,u); %% s(n) or step response is impulse response h[n] conv
 u[n]
```

plotting responses

```
figure(3)
subplot(211)
stem(n1,h,'r*')
grid on
title("Impulse response in time domain")
xlabel("time")
ylabel("amp")
axis([-40 10  -35 35])

n2 = -29 : 1 : 29;
```

```
subplot(212)
stem(n2,s,'g')
grid on
title("Step response in time domain")
xlabel("time")
ylabel("amp")
axis([-10 40  -35 35])
```



Function Step Sequence

```
function [x,n] = stepseq(n0,n1,n2)
% Generates x(n) = u(n-n0); n1 <= n <= n2
% ---------------------------------------
% [x,n] = stepseq(n0,n1,n2)
%
n = [n1:n2]; x = [(n-n0) >= 0];
end
```

Published with MATLAB® R2020b