Juan Tarrat

HOMEWORK 5

1.

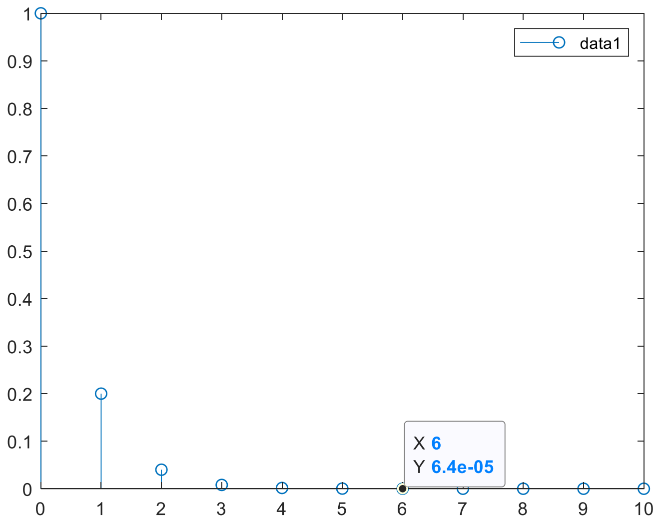
a. $h(n) = \frac{1}{5}h(n-2) + \delta(n)$

b. Plugging in values we get that: h(0) = 1, h(1), h(2) = $0.2^1$, h(3) = 0, h(4) = $0.2^2$ . . .

$$y(n) = \begin{cases} 0.2^{\frac{k}{2}} & for \quad k = 2n \\ 1 & for \quad n = 0 \\ 0^k & for \quad k = 2n + 1 \end{cases}$$

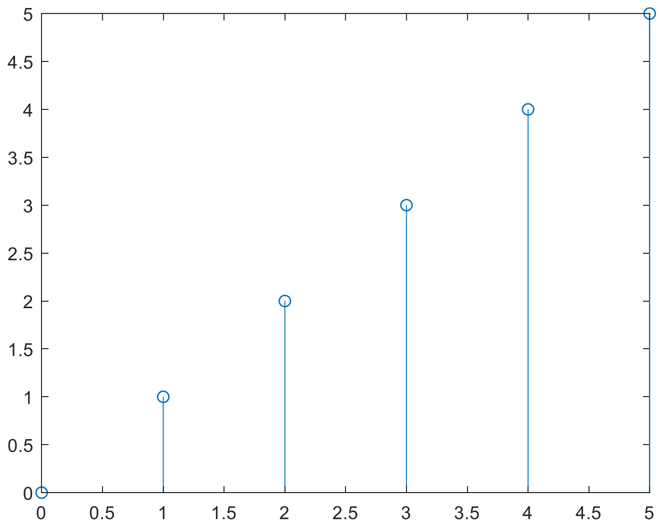
c.

```
1.0000    0.2000    0.0400    0.0080    0.0016    0.0003    0.0001    0.0000    0.0000    0.0000    0.0000
```




2.

a) h(n) = k for n = 0, 1, 2, 3, 4, 5



Juan Tarrat

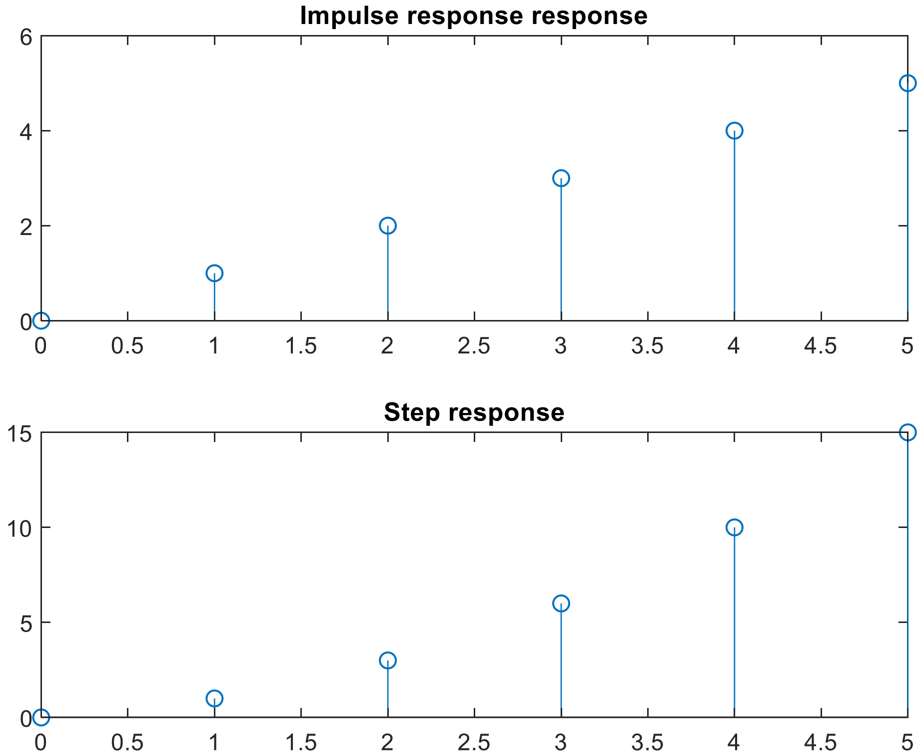
b) The system is causal and stable

c) $s(n) = u(n-1) + 2u(n-2) + 3u(n-3) + 4u(n-4) + 5(u-5)$

$s(0) = 0, s(1) = 1, s(2) = 3, s(3) = 6, s(4) = 10, s(5) = 15$

d) Maximum output is 15

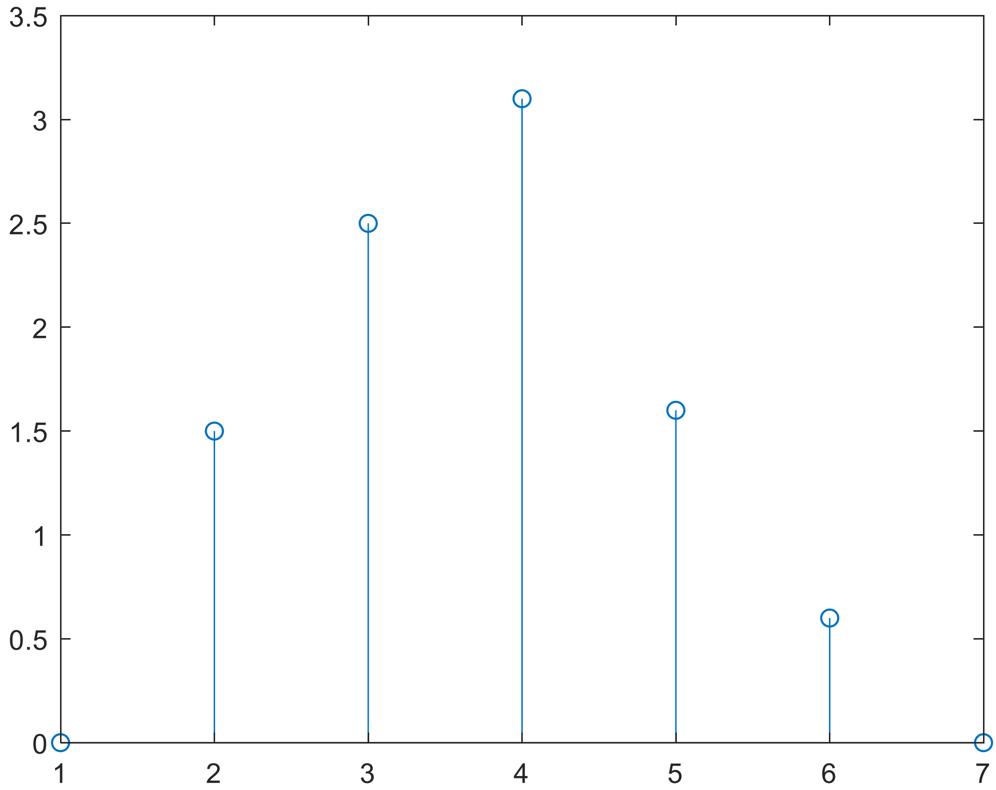
e)




```
%2
filtH = filter([0 1 2 3 4 5],1,[1 0 0 0 0 0]);
figure
subplot(2,1,1)
stem(0:5,filtH)
title('Impulse response response');
subplot(2,1,2)
filtu = filter([0 1 2 3 4 5],1,ones(1,6));
stem(0:5,filtu)
title('Step response');
```

Juan Tarrat

3.




```
xn = [0 1 1 1 0];
hn = [1.5 1 0.6];
n = -10:1:10;

y = conv(xn,hn)
figure
stem(y);
```

Juan Tarrat

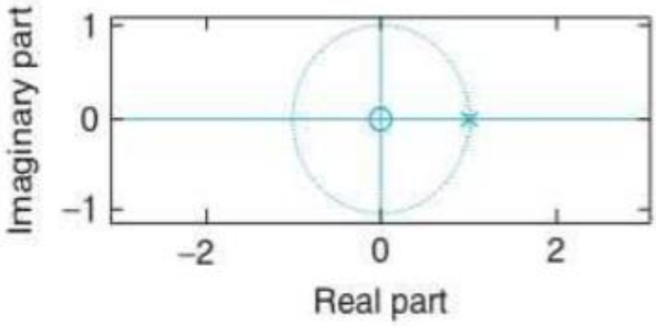
4.

a) The main difference resides in the consequences of not meeting the time constraints. If timing is not met in hard real-time systems their operation is incorrect severe whereas when timing is not met in soft real-time systems the operation is degraded. Also, hard systems manage larger data files.

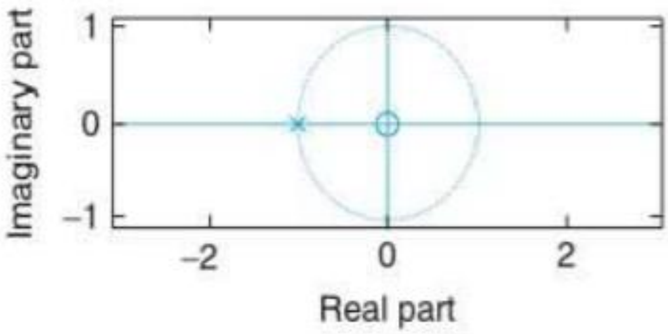
b) We know it takes 1200 * 1Mhz = 1.2ms to process an input and the maximum input frequency comes every 600Hz or 1.67 ms so we can operate in real time.

c) Our equation is $1200\frac{1}{x} = 1200Hz \rightarrow x = 1.44MHz$

5.

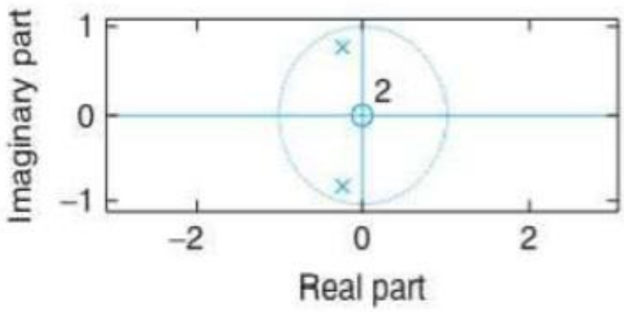



Signal is u(n), constant for n >= 0

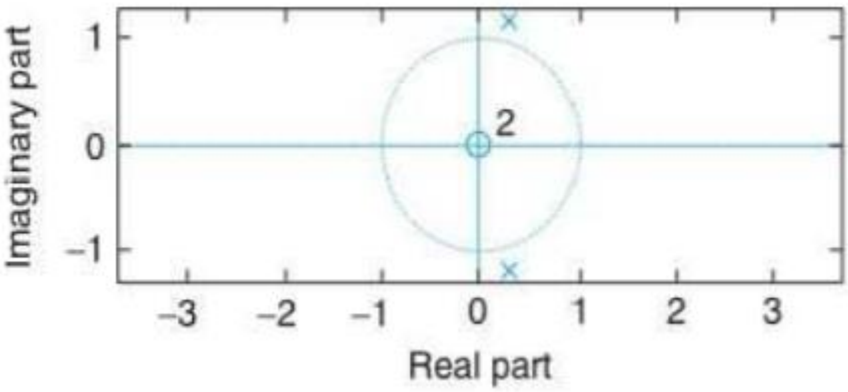



Signal is cosine of frequency π with constant amplitude.

Juan Tarrat




Signal is a decaying modulated exponential.




Signal is a growing modulated exponential.

6.

Initial value is $x[0] = \lim_{z\to\infty} X(z)$

Final value is $\lim_{z\to\infty} x[n] = \lim_{z\to 1}(z-1)X(z)$