EE 3054 - Quiz 4 - Spring 2012

1) A discrete-time LTI system is implemented by the causal difference equation:

$$y(n) = x(n) + \sqrt{2}\,y(n-1) - y(n-2)$$

a) Find the poles & zeros of the system. Plot the pole-zero diagram

b) Find the impulse response $h(n)$. Write h(n) with out using 'j'. It should be in terms of real numbers only.

c) Classify the system as stable/unstable

2) A discrete-time LTI system has impulse response

$$h(n) = \left(\frac{1}{3}\right)^n \cos\left(\frac{\pi}{2}n\right) u(n).$$

a) Find a difference equation to implement the system

b) Sketch the pole-zero diagram

3) A discrete-time LTI system has impulse response

$$h(n) = (0.7)^n \cos(0.3\pi n)\,u(n).$$

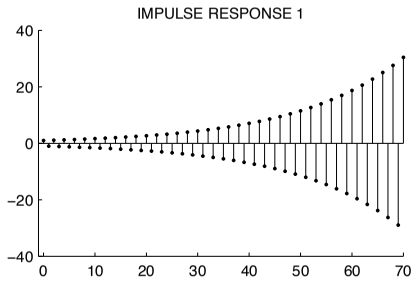
Find the output signal, $y(n)$ produced by the input signal

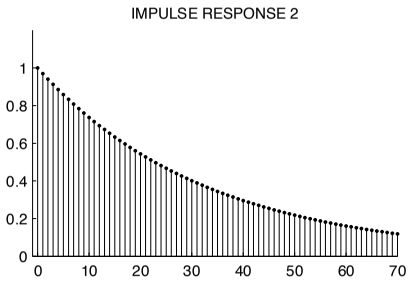
$$x(n) = (0.8)^n u(n).$$

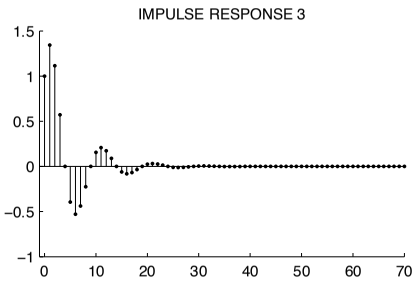
You need not compute the residues in the partial fraction expansion (PFE) you can leave them as general constants.
Your answer should not contain 'j'.

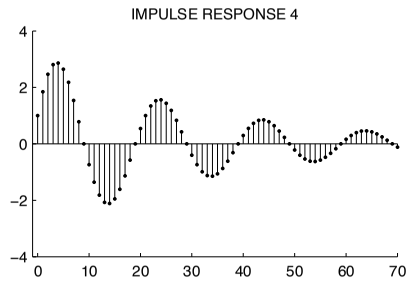
4) The impulse responses & p-z diagrams of 6 systems are shown - out of order. Match them by completing the table

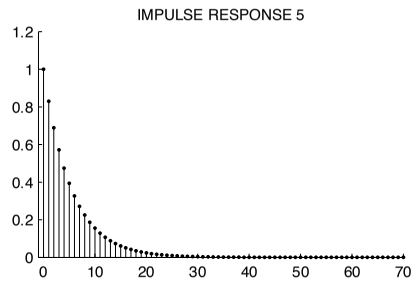
Impulse Response	p-z diagram
1	
2	
3	?
4	
5	
6	

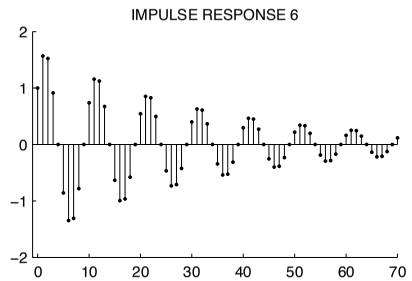

IMPULSE RESPONSE 1

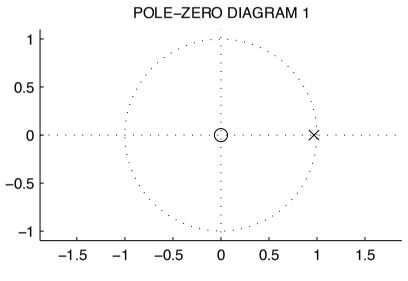

IMPULSE RESPONSE 2

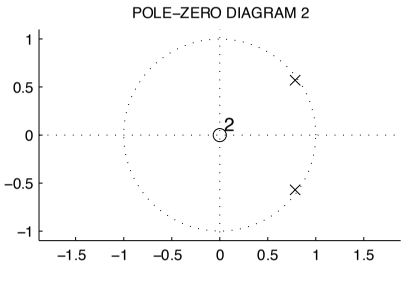

IMPULSE RESPONSE 3

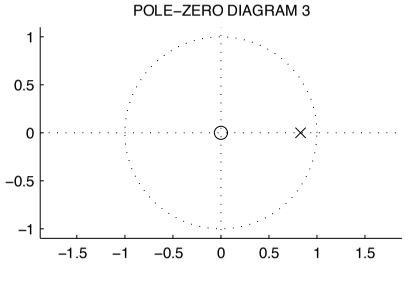

IMPULSE RESPONSE 4

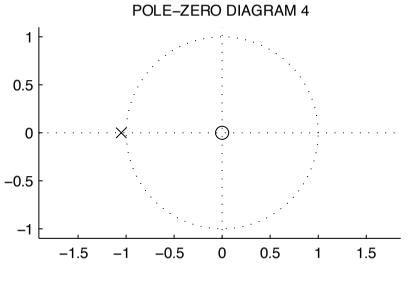

IMPULSE RESPONSE 5

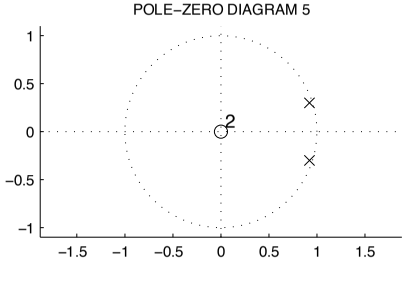

IMPULSE RESPONSE 6

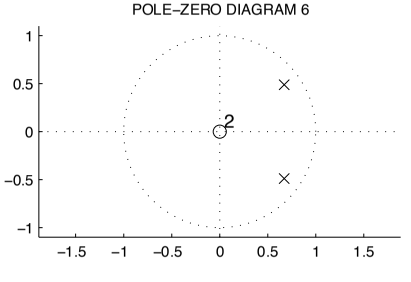

POLE–ZERO DIAGRAM 1


POLE–ZERO DIAGRAM 2


POLE–ZERO DIAGRAM 3


POLE–ZERO DIAGRAM 4


POLE–ZERO DIAGRAM 5


POLE–ZERO DIAGRAM 6