EE 3054 - Fall 2011.

Quiz 2.

① An LTI system (causal) is implemented using the difference equation

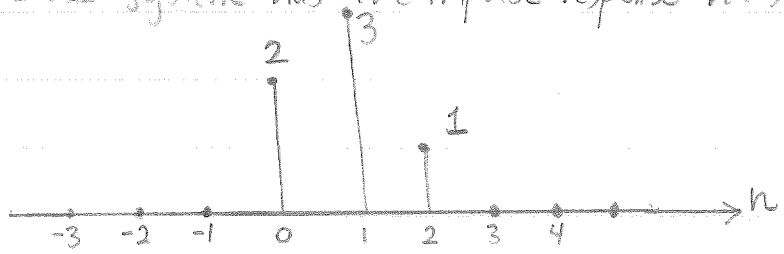
$$y(n) = 0.5\,x(n) + x(n-1) - 0.5\,x(n-2)$$

where $x(n)$ is the input & $y(n)$ is the output.

a) Sketch the impulse response

b) Find the transfer function

② An LTI system has the impulse response $h(n)$:



a) Find the transfer function

b) Find a difference eq that implements the system

③ A ~~causal~~ LTI system has transfer function $H(z)$

$$H(z) = 3z + 4 + 2z^{-1} + z^{-3}.$$

a) sketch the impulse response of the system.

b) A new system (LTI) is defined with transfer function $G(z)$

$$G(z) = H(-z).$$

Sketch the impulse response of this system

c) A new LTI system is defined with transfer function $F(z)$

$$F(z) = H(1/z)$$

Sketch the impulse response of this system.

④ An LTI system has impulse response $h(n)$

$$h(n) = 4\left(\tfrac{1}{3}\right)^n u(n).$$

a) Find the transfer function.
b) Find a difference equation to implement the system.

⑤ A causal LTI system has transfer function $H(z)$

$$H(z) = \frac{3 + 2z^{-1} - z^{-2}}{1 + 4z^{-1} - \frac{1}{2}z^{-2}}$$

Find a difference equation to implent the system.

⑥ An LTI system with impulse response $h(n)$

$$h(n) = 4\left(\tfrac{1}{2}\right)^n u(n)$$

is used to filter the input signal $x(n)$

$$x(n) = 2\left(\tfrac{1}{3}\right)^n u(n)$$

Find the output signal.

⑦ Two LTI systems are connected in series → H_1 → H_2 → with transfer functions $H_1(z) = 2 + z^{-1}$ and $H_2(z) = 3 + 2z^{-1}$. Find the impulse response of the total system.