EE 3054 Quiz 3 (Discrete-time systems)
Spring 2012

1. For the causal LTI system implemented by the difference equation

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

   (a) Find the transfer function $H(z)$.
   (b) Find the impulse response $h(n)$.

2. For the causal LTI system implemented by the difference equation

$$y(n) = x(n) + x(n-1) - \frac{1}{6}\,y(n-1) + \frac{1}{6}\,y(n-2)$$

   (a) List the poles of the system.
   (b) Find the impulse response $h(n)$. You do not need to compute the residues (constants) in the partial fraction expansion. You may leave them as ‘A’ and ‘B’.

3. For the LTI system with impulse response $h(n) = \delta(n) + 2\delta(n-1) - \delta(n-2)$, write a difference equation that implements the system.

4. For the LTI system with impulse response

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

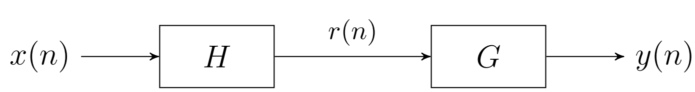
   write a difference equation that implements the system.

5. An LTI system has an impulse response $h(n) = (0.9)^n\,u(n)$. Find the impulse response $g(n)$ of the stable inverse to this system. Also, sketch the impulse response $g(n)$.

6. For the signal $h(n) = 2\,(3^n)\,u(-n-1)$, find the Z-transform $H(z)$ and the region of convergence (ROC).

7. A causal LTI system is implemented with the difference equation $y(n) = 0.5\,x(n) + x(n-1)$. Find the impulse response $g(n)$ of the stable inverse to this system.

8. Two LTI systems are connect in series



   where systems H and G are implemented by the difference equations:

$$\begin{aligned} H:&\quad r(n) = x(n) + 2\,x(n-1) - 0.5\,r(n-1) \\ G:&\quad y(n) = 2\,r(n) + r(n-1) \end{aligned}$$

   Find the difference equation of the total system.