ECE 2713
Homework 4

Spring 2024   Dr. Havlicek

1. H is a discrete-time LTI system with impulse response
$$h[n] = -\delta[n] + 2\delta[n-1] - \delta[n-2].$$
The system input is given by
$$x[n] = \delta[n+2] + 2\delta[n+1] + 3\delta[n] + 2\delta[n-1] + \delta[n-2].$$
Find the output signal $y[n]$.

2. H is a discrete-time LTI system with impulse response
$$h[n] = \delta[n] - 2\delta[n-1] + 3\delta[n-2].$$
Find the output signal $y[n]$ in terms of the input signal $x[n]$ (use the convolution equation and the properties of convolution with deltas). **Hint:** since the input signal $x[n]$ is *unknown*, your answer should express the output signal $y[n]$ as a linear combination of the shifts of $x[n]$.

3. H is a discrete-time LTI system with impulse response
$$h[n] = \left(\frac{1}{3}\right)^n u[n].$$
The system input is given by
$$x[n] = \left(\frac{1}{4}\right)^n u[n].$$
Find the output signal $y[n]$.

4. H is a discrete-time LTI system with impulse response
$$h[n] = \begin{cases} 1, & 2 \le n \le 5, \\ 0, & \text{otherwise.} \end{cases} = u[n-2] - u[n-6].$$
The system input is given by
$$x[n] = \left(-\frac{1}{3}\right)^n u[n].$$
Find the output signal $y[n]$.

5. H is a discrete-time LTI system with impulse response
$$h[n] = \left(\frac{1}{3}\right)^n u[n].$$
The system input is given by
$$x[n] = \left(\frac{1}{4}\right)^{|n|} = \begin{cases} \left(\frac{1}{4}\right)^n & n \ge 0, \\ 4^n, & n < 0. \end{cases}$$
Find the output signal $y[n]$.

Scan or photograph your paper and upload to Canvas.

DUE: 3/14/2024, 11:59 PM