

CPE 3500 Homework-3

1. Let

$$x[n] = \delta[n] + 2\delta[n-1] - \delta[n-3] \quad \text{and} \quad h[n] = 2\delta[n+1] + 2\delta[n-1].$$

Compute and plot each of the following convolutions:

- a. $y[n] = x[n] * h[n]$
- b. $y[n] = x[n] * h[n+2]$

2. Compute and plot $y[n] = x[n] * h[n]$, where

$$x[n] = \begin{cases} 1, & 3 \leq n \leq 8 \\ 0, & \text{otherwise} \end{cases},$$
$$h[n] = \begin{cases} 1, & 4 \leq n \leq 15 \\ 0, & \text{otherwise} \end{cases}.$$

Show and verify your result using Discrete Time Convolution Simulation in Matlab.

3. The following are the impulse responses of LTI systems. Determine whether each system is causal and/or stable. Justify your answers.

- a. $h[n] = \left(\frac{1}{5}\right)^n u[n]$
- b. $h[n] = (0.8)^n u[n+2]$
- c. $h[n] = \left(\frac{1}{2}\right)^n u[-n]$
- d. $h[n] = (5)^n u[3-n]$
- e. $h(t) = e^{-4t} u(t-2)$
- f. $h(t) = e^{2t} u(-1-t)$

4. Let

$$x(t) = u(t-3) - u(t-5) \quad \text{and} \quad h(t) = e^{-3t} u(t).$$

Compute $y(t) = x(t) * h(t)$. Use Continuous Time Convolution Simulation in Matlab to verify your result.