Home Assignment - 03

IEC 240, DSAA
Anish Turlapaty PhD,
Indian Institute of Information Technology Sri City,
Sri City, Andhra Pradesh

I. LTI SYSTEMS

- Consider the signal

$$x[n] = \alpha^n u[n] \tag{1}$$

  - Sketch the signal $g[n] = x[n] - \alpha x[n-1]$
  - Note: Need not use matlab for this part of the exercise. Assume $\alpha = \frac{1}{2}$. Use the result above in conjunction with properties of the linear convolution to determine a sequence $h[n]$ such that

$$x[n] * h[n] = \left(\frac{1}{2}\right)^n \left\{ u[n+2] - u[n-2] \right\} \tag{2}$$

- Solve the following problem using matlab and theoretical approaches and compare the results.
  Consider the two LTI systems with the unit sample responses $h_1[n]$ and $h_2[n]$ given below. These two systems are cascaded. Let the input be $x[n] = (-1)^{n+1} \{u[n] - u[n-6]\}$.

$$
\begin{aligned}
h_1[n] &= \left(-\frac{1}{2}\right)^n \{u[n] - u[n-5]\} \\
h_2[n] &= u[n+4] - u[n]
\end{aligned}
$$

  - Compute $y[n]$ by first computing $w[n] = x[n] * h_1[n]$ and then computing $y[n] = w[n] * h_2[n]$.
  - Again compute $y[n]$ by first convolving $h_1[n]$ with $h_2[n]$ to obtain $g[n] = h_1[n] * h_2[n]$ and the convolving $x[n]$ with $g[n]$. Compare the two results.

- For this exercise, in order to verify the coincidence of the results, please plot the two results in the same plot, one with a smaller marker size and the other with a larger marker size.

II. INSTRUCTIONS AND GRADING SCHEME

Merge all the sections into a single pdf file and upload.

- 1: Matlab code and Results (Grade: 4 points)
- 2: Theoretical Results (Grade: 4 points)
- 3: Discussion (Grade: 2 points)