Assignment 1

DEEP - EE18BTECH11011

Download all python codes from

https://github.com/Deep−2903/EE3025/Assignment1/codes

and latex-tikz codes from

https://github.com/Deep−2903/EE3025/Assignment1

1 Problem

Let

$$x(n) = \left\{ \underset{\uparrow}{1}, 2, 3, 4, 2, 1 \right\} \tag{1.0.1}$$

$$y(n) + \frac{1}{2}y(n-1) = x(n) + x(n-2) \tag{1.0.2}$$

Compute

$$X(k) \triangleq \sum_{n=0}^{N-1} x(n)e^{-j2\pi kn/N}, \quad k = 0, 1, \ldots, N-1 \tag{1.0.3}$$

and $H(k)$ using $h(n)$.

2 Solution

We know that Impulse response of the LTI system is the output of the system when the given input to the system is an Impulse signal. Therefore, using equation (1.0.2) we can say that the Impulse response of the system is,

$$h(n) + \frac{1}{2}h(n-1) = \delta(n) + \delta(n-2) \tag{2.0.1}$$

Now we know that DFT of a Input Signal $x(n)$ is give as :

$$X(k) \triangleq \sum_{n=0}^{N-1} x(n)e^{-j2\pi kn/N}, \quad k = 0, 1, \ldots, N-1 \tag{2.0.2}$$

and similarly the DFT of Impulse Response $h(n)$ is,

$$H(k) \triangleq \sum_{n=0}^{N-1} h(n)e^{-j2\pi kn/N}, \quad k = 0, 1, \ldots, N-1 \tag{2.0.3}$$

Now to compute the DFT of $x(n)$ and $h(n)$ we use the following python code.

https://github.com/Deep−2903/EE3025/Assignment1/codes

Using the above code we get the following plots.

https://github.com/Deep−2903/EE3025/Assignment1/figs