EE3025 IDP

Assignment-1

Download all python codes from

https://github.com/Sivanidevarapalli26/EE3025_IDP/tree/main/Assignment-1/Codes

and latex-tikz codes from

https://github.com/Sivanidevarapalli26/EE3025_IDP/tree/main/Assignment-1

1 Question

1.1. Let

$$x(n) = \left\{ \underset{\uparrow}{1}, 2, 3, 4, 2, 1 \right\} \quad (1.1.1)$$

$$y(n) + \frac{1}{2}y(n-1) = x(n) + x(n-2) \quad (1.1.2)$$

Compute

$$X(k) \triangleq \sum_{n=0}^{N-1} x(n)e^{-j2\pi kn/N}, \quad k = 0, 1, \ldots, N-1 \quad (1.1.3)$$

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

2 Solution

2.1. When Unit impulse signal is given as input to the LTI system then its impulse response is the ouput of the system. So,from equation (1.1.2) we can say that the Impulse response of the system is,

$$h(n) + \frac{1}{2}h(n-1) = \delta(n) + \delta(n-2) \quad (2.1.1)$$

2.2. Given that DFT of a Input Signal $x(n)$ is :

$$X(k) \triangleq \sum_{n=0}^{N-1} x(n)e^{-j2\pi kn/N}, \quad k = 0, 1, \ldots, N-1 \quad (2.1.2)$$

2.3. Similarly, DFT of Impulse Response $h(n)$ is,

$$H(k) \triangleq \sum_{n=0}^{N-1} h(n)e^{-j2\pi kn/N}, \quad k = 0, 1, \ldots, N-1 \quad (2.1.3)$$

2.4. Python Code to compute the DFT of $x(n)$ and $h(n)$ is given below

https://github.com/Sivanidevarapalli26/EE3025_IDP/blob/main/Assignment-1/Codes/ee18btech11012.py

2.5. From the above code we get the following plots.

https://github.com/Sivanidevarapalli26/EE3025_IDP/tree/main/Assignment-1/figs

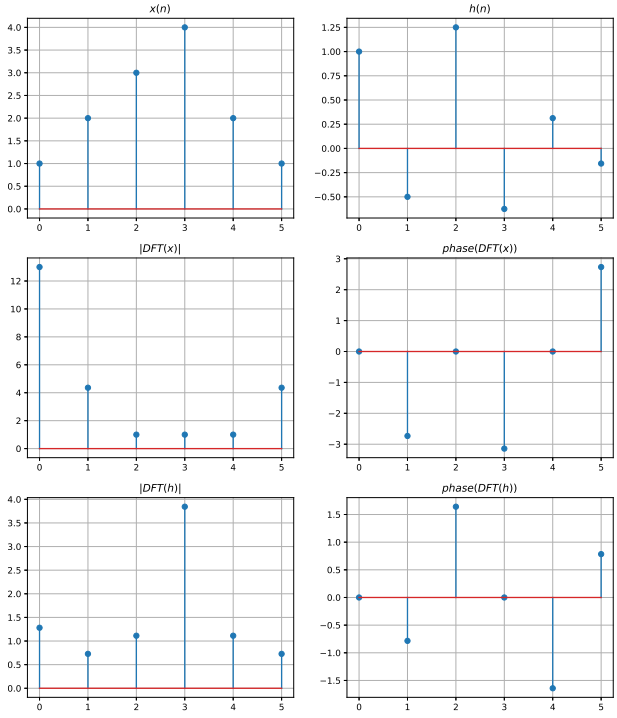

Fig. 2.1: Plots of x(n) and h(n),their DFTs