EE3025 Assignment-1

Kamparaju Srikanth - EE18BTECH11023

Download all python codes from

https://github.com/srikanth2001/EE3025-DSP/tree/main/Assignment-01/codes

and latex-tikz codes from

https://github.com/srikanth2001/EE3025-DSP/blob/main/Assignment-01/ee18btech11023.tex

1 Problem

1.1. Let

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

$$h(n) = \left(-\frac{1}{2}\right)^n u(n) + \left(-\frac{1}{2}\right)^{n-2} u(n-2) \quad (1.1.2)$$

1.2. Compute X(k), H(k) and y(n) using FFT and IFFT

2 Solution

2.1. input signal x(n)

$$x(n) = \left\{\underset{\uparrow}{1}, 2, 3, 4, 2, 1\right\} \quad (2.1.1)$$

2.2. Impulse Response of the System is

$$h(n) = \left(-\frac{1}{2}\right)^n u(n) + \left(-\frac{1}{2}\right)^{n-2} u(n-2) \quad (2.2.1)$$

2.3. FFT of a Input Signal $x(n)$ is

$$X(k) = \sum_{n=0}^{N-1} x(n) e^{-j2\pi kn/N}, \quad k = 0, 1 \ldots N-1 \quad (2.3.1)$$

2.4. FFT of a Impulse Response $h(n)$ is

$$H(k) = \sum_{n=0}^{N-1} h(n) e^{-j2\pi kn/N}, \quad k = 0, 1, \ldots, N-1 \quad (2.4.1)$$

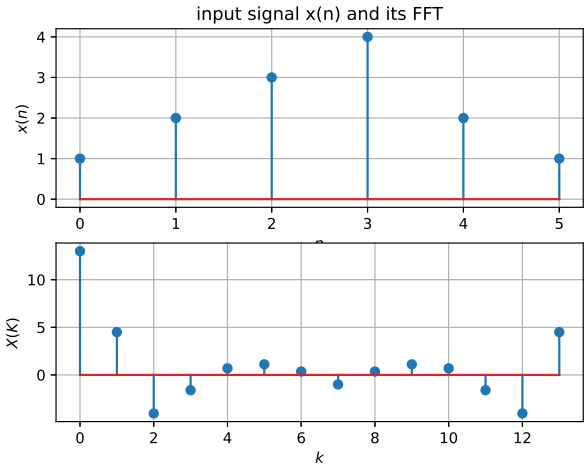

Fig. 2.3: input signal x(n) and FFT of x(n)

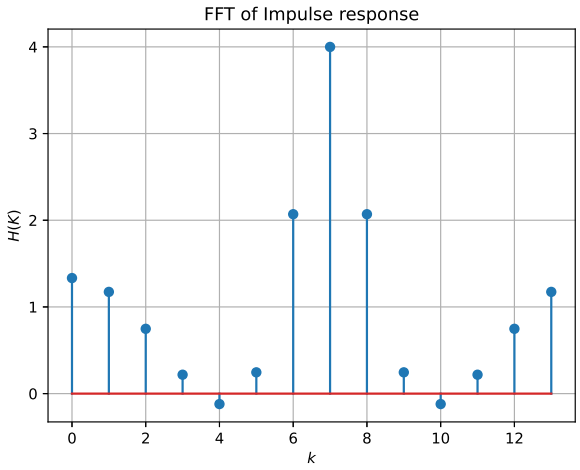

Fig. 2.4: FFT of Impulse response H(k)

2.5. then FFT of output Signal $y(n)$ can be computed by

$$Y(k) = X(k)H(k) \quad (2.5.1)$$

2.6. $y(n)$ can be computed by doing IFFT for $Y(k)$

$$y(n) = \frac{1}{N} \sum_{n=0}^{N-1} Y(k) e^{j2\pi nk/N}, \quad k = 0, 1, \ldots, N-1 \tag{2.6.1}$$

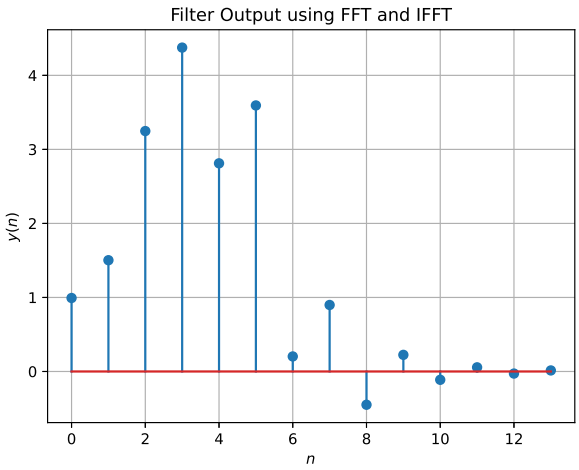

Fig. 2.6: output signal y(n)