Assignment-1 (EE3025)

EE18BTECH11013 - Divyansh Maduriya

Download all python codes from

https://github.com/Divyansh−28/EE3025−EE18BTECH11013/tree/master/codes

and latex-tikz codes from

https://github.com/Divyansh−28/EE3025−EE18BTECH11013

1 Problem

Compute

$$X(k) \triangleq \sum_{n=0}^{N-1} x(n)e^{-j2\pi kn/N}, \quad k = 0, 1, \ldots, N-1 \tag{1.0.1}$$

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

2 Solution

we know that

$$y(n) + \frac{1}{2}y(n-1) = x(n) + x(n-2) \tag{2.0.1}$$

$$Where, x(n) = \left\{\underset{\uparrow}{1}, 2, 3, 4, 2, 1\right\} \tag{2.0.2}$$

Taking Z-transform

$$Y(z) = \frac{2(z^2+1)}{z(2z+1)}X(z) \tag{2.0.3}$$

and

$$H(z) = \frac{2(z^2+1)}{z(2z+1)} \tag{2.0.4}$$

$$H(z) = \left[\frac{1}{1+\frac{1}{2}z^{-1}} + \frac{z^{-2}}{1+\frac{1}{2}z^{-1}}\right]z^{-1} \tag{2.0.5}$$

Taking Inverse Z-Transform,

$$h(n) = \left[\frac{-1}{2}\right]^{n-2} u(n-2) + \left[\frac{-1}{2}\right]^{n} u(n) \tag{2.0.6}$$

From equation 1.0.1

$$X(k) = \sum_{n=0}^{N-1} x(n)e^{-j2\pi kn/N}, \quad k = 0, 1, \ldots, N-1 \tag{2.0.7}$$

and

$$H(k) = \sum_{n=0}^{N-1} h(n)e^{-j2\pi kn/N}, \quad k = 0, 1, \ldots, N-1 \tag{2.0.8}$$

Plots:

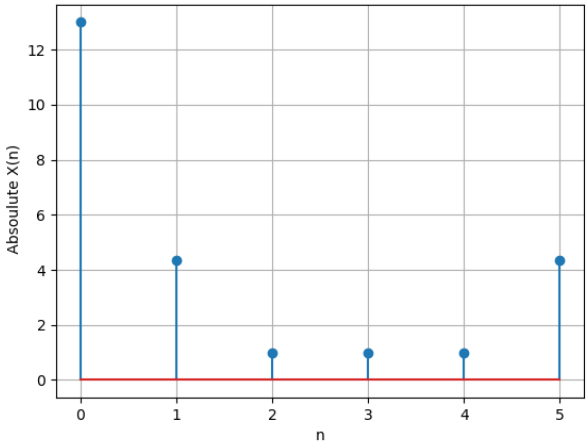

Fig. 0: Abs X(n)

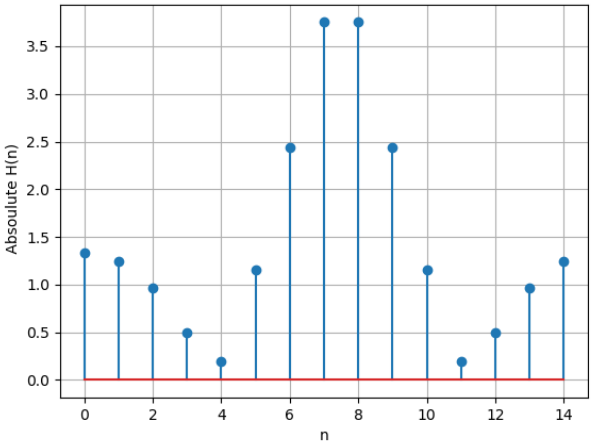

Fig. 0: Abs H(n)

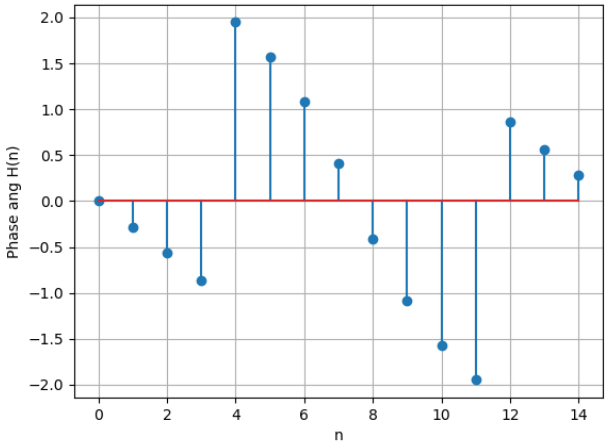

Fig. 0: Phase of h(k)

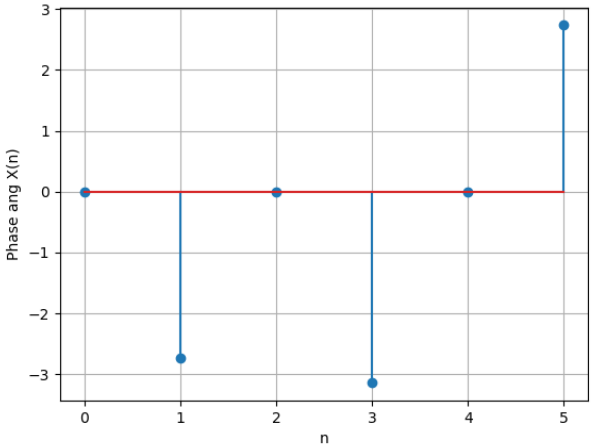

Fig. 0: angle X(n)