Gate-Assignment

Manikanta vallepu - AI20BTECH11014

Download all python codes from

https://github.com/AI20BTECH11014/EE3900-Linear-Systems-and-Signal-processing/blob/main/Gate_assignment/Gate_assignment.py

and latex-tikz codes from

https://github.com/AI20BTECH11014/EE3900-Linear-Systems-and-Signal-processing/blob/main/Gate_assignment/Gate_assignment.tex

1 QUESTION: Q.55 EC-GATE-2018

Let $X[k] = k+1, 0 \le k \le 7$ be 8-point DFT of a sequence $x[n]$,where

$$X[k] = \sum_{n=0}^{N-1} x[n] e^{\frac{-j2\pi nk}{N}}$$

The value (correct to two decimal places) of $\sum_{n=0}^{3} x[2n]$

2 SOLUTION

Given,

$$X[k] = \sum_{n=0}^{N-1} x[n] e^{\frac{-j2\pi nk}{N}}$$

when k = 0,

$$X[0] = \sum_{n=0}^{7} x[n] \tag{2.0.1}$$

when k= 4,

$$X[4] = \sum_{n=0}^{7} x[n] e^{-j\pi n} \tag{2.0.2}$$

$$X[4] = \sum_{n=0}^{7} x[n](-1)^n \tag{2.0.3}$$

we need to find $\sum_{n=0}^{3} x[2n]$,

$$\sum_{n=0}^{3} x[2n] = x[0] + x[2] + x[4] + x[6] \tag{2.0.4}$$

$$\sum_{n=0}^{3} x[2n] = 2\frac{x[0] + x[2] + x[4] + x[6]}{2} \tag{2.0.5}$$

$$\sum_{n=0}^{3} x[2n] = \frac{\sum_{n=0}^{7} x[n]}{2} + \frac{\sum_{n=0}^{7} x[n](-1)^n}{2} \tag{2.0.6}$$

$$\sum_{n=0}^{3} x[2n] = \frac{X[0] + X[4]}{2} \tag{2.0.7}$$

$$\sum_{n=0}^{3} x[2n] = \frac{1+5}{2} \tag{2.0.8}$$

$$\therefore \sum_{n=0}^{3} x[2n] = 3 \tag{2.0.9}$$

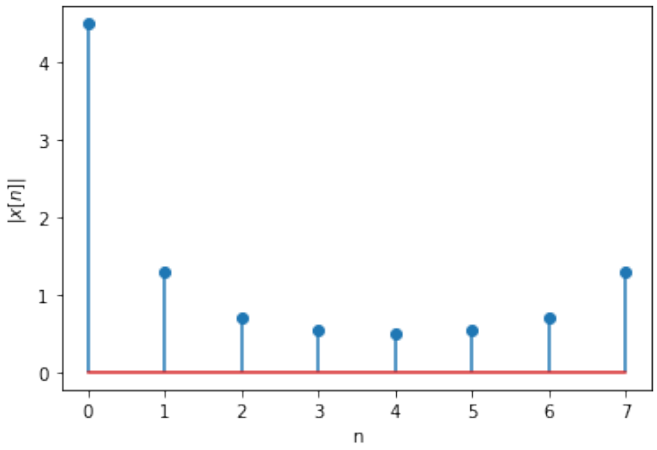

Fig. 0: Magnitude of $x[n]$ vs n