EE3900 : Gate-Assignment

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Download all python codes from

```
https://github.com/Rahul27n/EE3900/blob/main/
    Gate_Assignment/Gate_Assignment.py
```

and latex-tikz codes from

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https://github.com/Rahul27n/EE3900/blob/main/
    Gate_Assignment/Gate_Assignment.tex
```

1 QUESTION: Q.33 EC-GATE-2016

The Discrete Fourier Transform (DFT) of the 4 point sequence $x[n] = \{3, 2, 3, 4\}$ is given by $X[k] = \{12, 2j, 0, -2j\}$. If $X_1[k]$ is the DFT of the 12 point sequence $x_1[n] = \{3, 0, 0, 2, 0, 0, 3, 0, 0, 4, 0, 0\}$, the value of $\left|\frac{X_1[8]}{X_1[11]}\right|$ is :

2 SOLUTION

We can clearly observe that the sequence $x_1[n]$ is a interpolation in time domain of the point sequence $x[n]$ i.e;

$$x_1[n] = x\left[\frac{n}{3}\right] \tag{2.0.1}$$

We know that interpolation in time domain is equivalent to replication in the frequency domain.

$$X_1[k] = \{12, 2j, 0, -2j, 12, 2j, 0, -2j, 12, 2j, 0, -2j\} \tag{2.0.2}$$

Hence from (2.0.2) we have:

$$X_1[8] = 12 \tag{2.0.3}$$
$$X_1[11] = -2j \tag{2.0.4}$$

Therefore from (2.0.3) and (2.0.4) we have:

$$\left|\frac{X_1[8]}{X_1[11]}\right| = \left|\frac{12}{-2j}\right| = \left|6j\right| = 6 \tag{2.0.5}$$

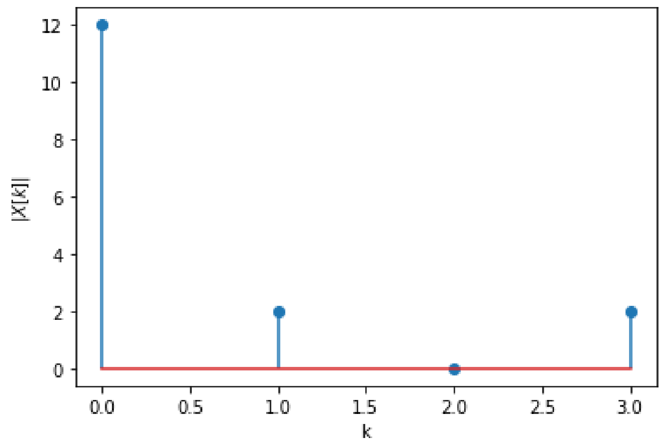

Fig. 0: Magnitude of $X[k]$ vs k

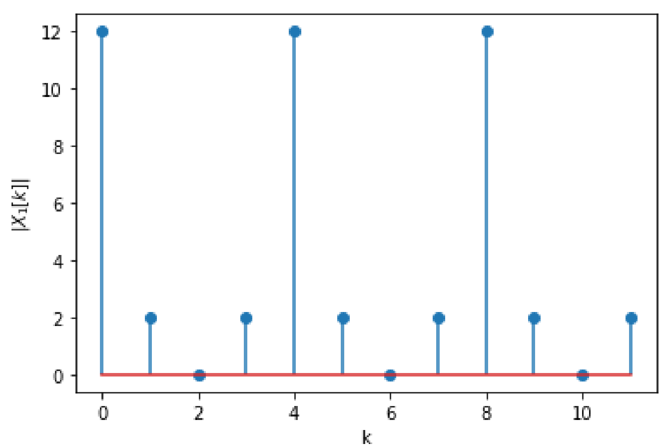

Fig. 0: Magnitude of $X_1[k]$ vs k