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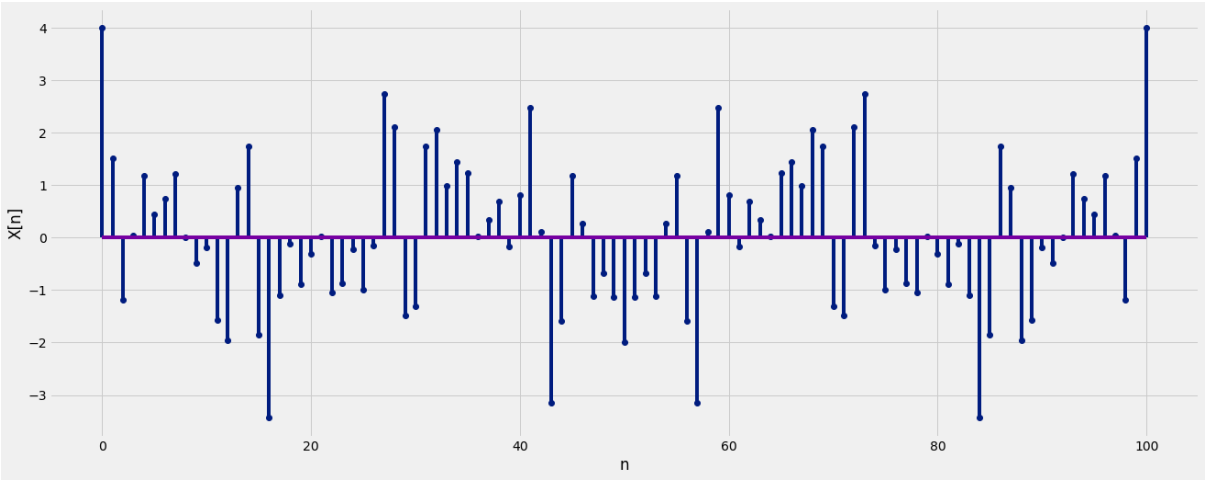
Assignment-1 (Signal and system)

In this assignment, we are doing Predictive maintenance, in this we monitor the condition of equipment during normal use and reduce the chance of failure. We can do this by the data which is generated in the form of signal from vibration of machine. Now to find whether machine needs maintenance or not, I'm doing following steps: -

- X[n] is already given, we visualise graphs of x[n] vs n.



- We, see 101 values of x[n], so choose as many values of discrete frequency (Ω) from (-π to π) as you want but must be at equal interval so that we do not miss and value I between and hence I'm using linear spacing method (linspace) for that.

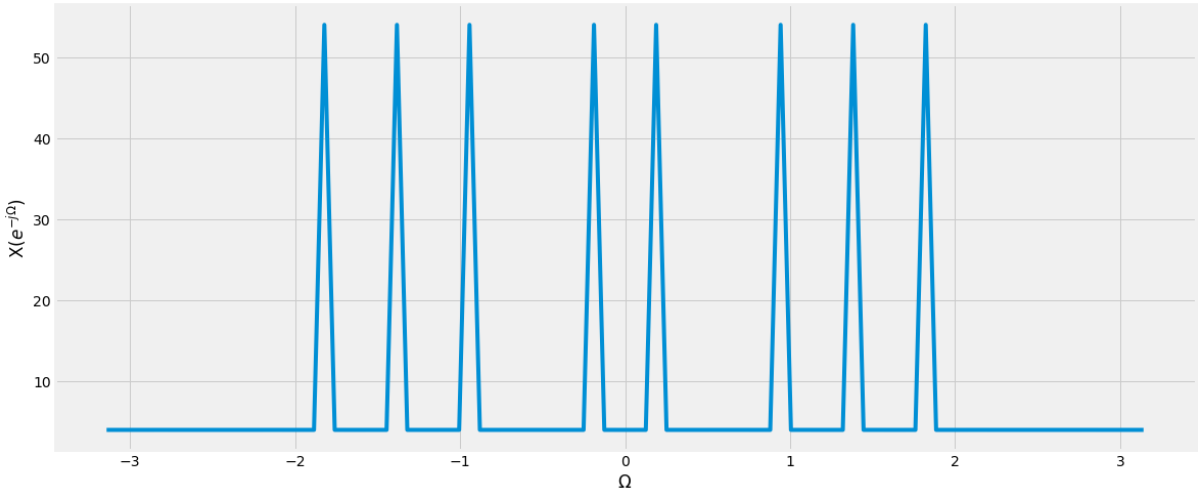
- The signal coming from the machine is x(t) which is continuous, so we have to first find the continuous frequency ω. So, we use the given signal x[n] and from that we apply DTFT to find suitable discrete frequency Ω.

- To find DTFT of x[n], we use formula which is given below: -

$$X(e^{-j\Omega}) = \sum_{i=0}^{100} x[n] e^{-jn\Omega}$$

- We get different values of $X(e-j\Omega)$, and eliminate those Ω for which $X(e-j\Omega)$ is equal to zero. (I'm getting 101 values of $X(e-j\Omega)$)

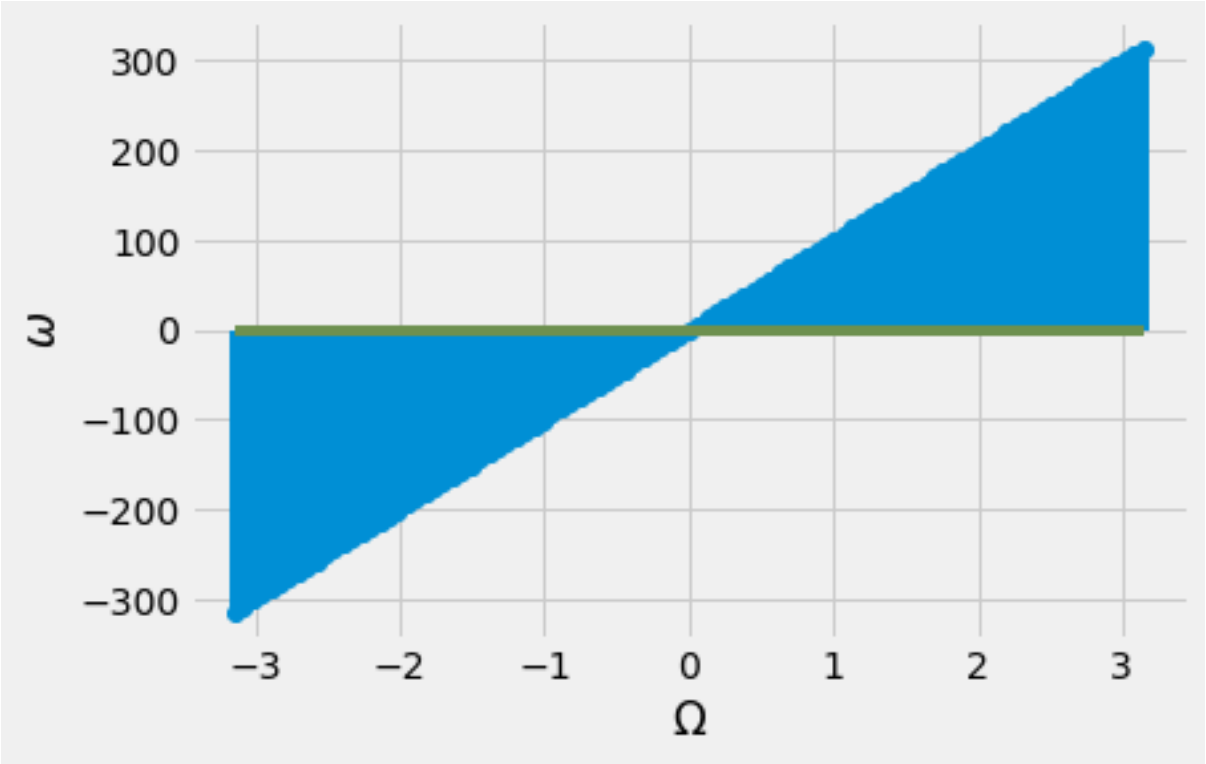
- Visualize a graph between $X(e-j\Omega)$ vs Ω.



- Now we need to find, ω (continuous frequency) from Ω (discrete frequency) to check whether ω < 25Hz or not. For that we use relation: - Ω = ω*T, where T (Time period) is equal to 1/f. And f (frequency) already given in question.

- After finding, ω we need to visualize its graph for more clearance.

- Visualise graph of ω vs Ω. And observe whether some value is greater than 25Hz or not.



- Here, we see some frequency are going beyond 25Hz. Hence, we state that this machine requires maintenance.

- All the codes have been attached in .ipynb file which you can open in google colab.