Fall 2021

Lab 08

EECS 360 – Signals and Systems

Use equation (1) to implement Discrete Fourier Transform for the following signal.

$$X_k = \sum_{n=0}^{N-1} x_n e^{\frac{-j2\pi kn}{N}} \qquad k = 0,1,2,...,N-1 \qquad .....(1)$$

$$x[n] = \begin{cases} 0, & \text{for } n \in [-128,-65]; \\ 1, & \text{for } n \in [-64,63]; \\ 0, & \text{for } n \in [64,127]; \end{cases}$$

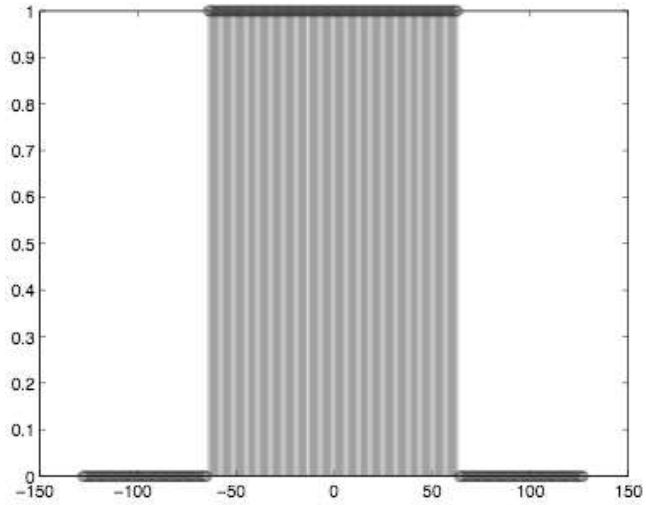

Figure 1: Signal $x[n]$

Use the "*stem*" and "*plot*" commands to graph the original sequence, the magnitude of the spectrum, and the phase of the spectrum.

2. Use the "stem" command to graph the original sequence x[n]. Plot it as a subplot.

3. Calculate the magnitude response of DFT and use the "stem" command to graph the magnitude spectrum of DFT, X[k]. Plot it as a subplot.

4. Calculate the phase response of DFT and use the "stem" command to graph the phase response of DFT, X[k]. Plot it as a subplot.

5. Use the built-in Matlab *fft* command on the sequence given in problem 1. Compare your results amplitude response to your DFT results. Plot it as a subplot. (Hint: The response should be similar in shape)

QUESTIONS:

1. Compute 4 point (N=4) DFT of the sequence x(n)={0,1,2,3} and sketch Magnitude and Phase response by hand. These plots will be like stem plots.