ECEn 487 - Introduction to Digital Signal Processing

Winter 2013

Quiz 6

$X[k] = \sum_{n=0}^{N-1} x[n] W_N^{kn}$

1. (2 pts) Evaluate the circular convolution with $N = 6$ of the sequences $x[n] = \delta[n]+2\delta[n-1]+3\delta[n-2]+4\delta[n-3]$ and $y[n] = \delta[n] + \delta[n-2] + \delta[n-3]$.

2. (3 pts) Suppose I have an aperiodic sequence of length 6, $x[n]$, which has a Fourier Transform of $X\left(e^{j\omega}\right) = 1 + e^{-jw} + 2e^{-5jw}$. Suppose I now take Discrete Fourier Transform of this sequence with a length of 8. What is $X[k]$?

3. (3 pts) Suppose I take the result of Problem 2, $X[k]$, and find $Y[k] = e^{-j(2\pi/N)3k} X[k]$. If I take the inverse DFT of $Y[k]$, what is $y[n]$?

4. (2 pts) Suppose I implement FIR filtering using the overlap-add method. I want to filter blocks of length 128. My filter length is 65. What is the least DFT length I need to implement this correctly?