

EE432 Fall 2011 Homework Problem Set 6 (PS06)

Due: 02 Dec 2011

1. Text, problem 10.6. Note: this problem is like the in-class problem from 11/14/11.
2. Text, problem 10.12. Note: you don't need to determine the filter, just the number of coefficients in the filter.
3. The DFT is computed by:

$$X[k] = \sum_{n=0}^{N-1} x[n] e^{-j2\pi \frac{k}{N} n} \text{ for } k=0, 1, 2, \dots, N-1$$

and the inverse DFT is computed by:

$$x[n] = \frac{1}{N} \sum_{k=0}^{N-1} X[k] e^{j2\pi \frac{k}{N} n} \text{ for } n=0, 1, 2, \dots, N-1$$

Write two MATLAB functions to compute these, one called *DFT.m* and the other called *iDFT.m*. Usage: $X = \text{DFT}(x)$, and $x = \text{iDFT}(X)$, where x is the original digital signal, and X is the DFT of x .

You should test your functions as needed to ensure you get the right results. You can use the MATLAB *fft* and *ifft* functions to test them.

4. Use your functions you created in problem 3 to compute the DFT of four samples of signal $x[n] = 5\delta[n] + 2\delta[n-1] - 2\delta[n-2] + 4\delta[n-3]$.
5. The DFT ($X[k]$) of a signal $x[n]$ is computed to be:

k	$X[k]$
0	21
1	$-1 + j1.73205$
2	$-6 + j3.464106$
3	-1
4	$-6 - j3.464106$
5	$-1 - j1.73205$

Use your iDFT function to compute the values of $x[n]$.

6. Text, problem 11.13.