EEE401F Class Test

11 May 2004

Name:

Student number:

Information

- The test is closed-book.
- This test has *four* questions, totalling 20 marks.
- Answer *all* the questions.
- You have 45 minutes.

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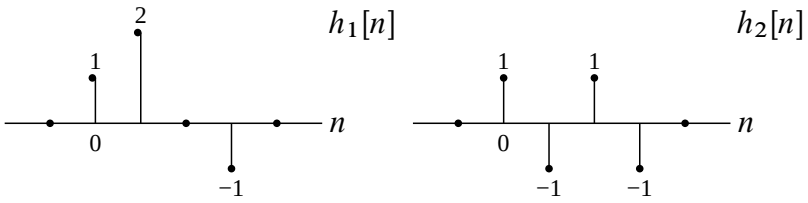
1. (5 marks) An N-sample signal $x[n]$ has the DFT $X[k]$. Write down expressions for the DFTs of the signals

   (a) $x[((n-2))_N]$

   (b) $2x[n] + x[((n+1))_N]$

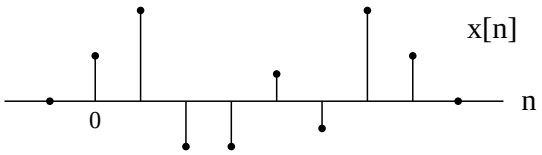
   (c) $x[((-n))_N]$.

2. (5 marks) Using any method of your choice, find the 5-point circular convolution between the following two signals:

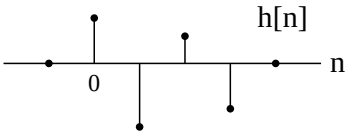


Explain how you would use the fast Fourier transform to obtain this result. What is the value of the output at $n = -2$?

3. (5 marks) Describe in detail how you would implement fast linear convolution on an 8-point signal such as

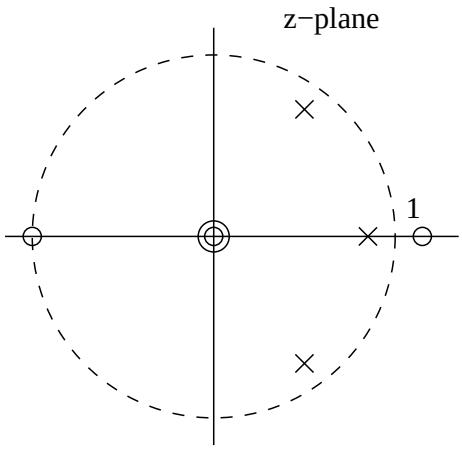


with a 4-tap FIR filter such as



using *only* an 8-point FFT procedure.

4. (5 marks) Sketch the magnitude response of the LTI system with the following pole-zero configuration:



What type of filter does this system represent? What is the approximate phase response of the system at $\omega = 0$?