

EEE401F: Digital Signal Processing

Class Test 2

25 May 2005

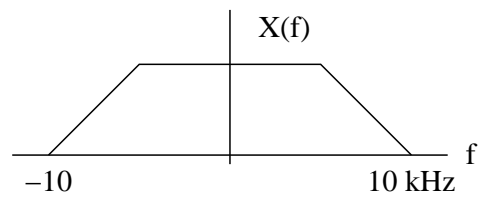
Name:

Student number:

Information

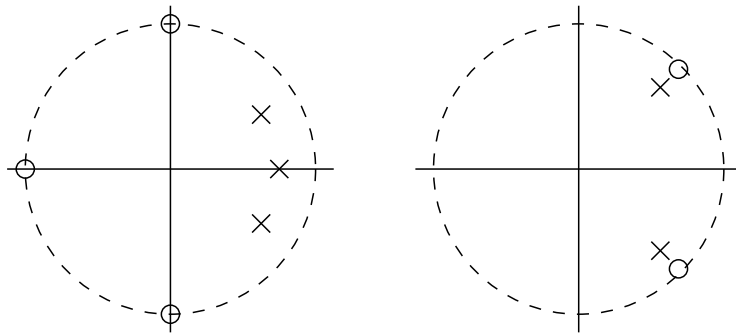
- The test is closed-book.
 - This test has *four* questions, totalling 20 marks.
 - Answer *all* the questions.
 - You have 45 minutes.
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1. (5 marks) A signal has the spectrum depicted below:



- Determine the minimum sampling frequency required for perfect reconstruction.
- Sketch the spectrum of the sampled signal if the sampling rate is 16 kHz .

2. (5 marks) Sketch the magnitude transfer functions of the systems with the following z-plane representations:



3. (5 marks) Explain, with examples and sketches, why windowing is important in spectrum estimation.

4. (5 marks) Consider the sequence $x[n] = 4\delta[n] + 3\delta[n - 1] + 2\delta[n - 2] + \delta[n - 3]$, and let $X[k]$ be the 6-point DFT of $x[n]$.
- (a) Find find finite-length sequence $y[n]$ that has a 6-point DFT $Y[k] = W_6^{4k} X[k]$.
 - (b) Find the DFT of the 6-point circular convolution of $x[n]$ with itself.