EEE401F: Digital Signal Processing

Class Test 2

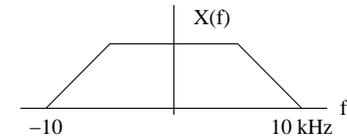### 25 May 2005

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:

(a) Determine the minimum sampling frequency required for perfect reconstruction.

(b) Sketch the spectrum of the sampled signal if the sampling rate is 16kHz.

2. (5 marks) Sketch the magnitude transfer functions of the systems with the following z-plane representations:
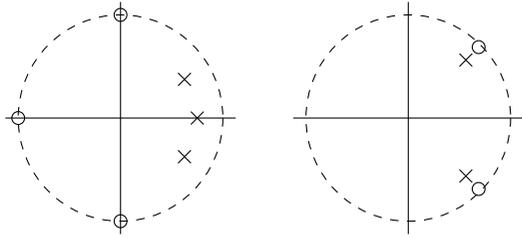
3. (5 marks) Explain, with examples and sketches, why windowing is important in spectrum estimation.

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.