EEE4001F: Digital Signal Processing

Class Test 1

27 March 2006

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) Determine the impulse response of the LTI system described by the difference equation
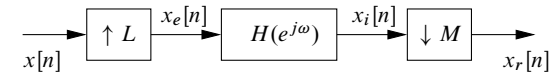
$$y[n] - 0.35y[n-1] = x[n]$$

under the assumption that it is (a) causal and (b) not causal.
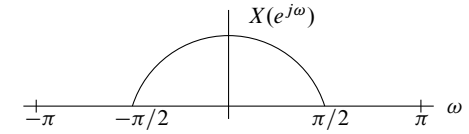
2. (5 marks) Sketch the sequence

$$y[n] = \alpha^{|n|}$$

for $|\alpha| < 1$ and find its DTFT. Why do we require $|\alpha| < 1$?

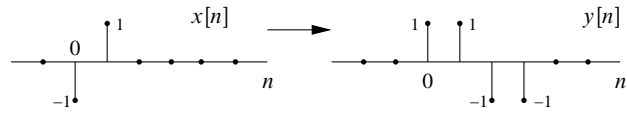3. (5 marks) Describe how a structure of the form

can be used to increase the sampling rate of the signal $x[n]$ by a factor of 1.5. Sketch representative Fourier transforms of the signals at different points in the system if
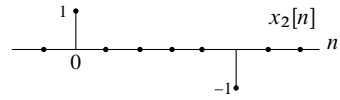

and specify $H(e^{j\omega})$.

4. (5 marks) Suppose $y[n]$ is the output of an LTI system when $x[n]$ is the input:

$$x[n] \quad \longrightarrow \quad y[n]$$

(a) What is the response of the system to the input

$x_2[n]$

(b) Find the impulse response $h[n]$ of this system.