

EEE401F Class Test

30 April 2003

Name:

Student number:

Information

- The test is closed-book.
 - This test has *six* questions, totalling 30 marks.
 - Answer *all* the questions.
 - You have 45 minutes.
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1. (5 marks) Consider the system function

$$H(z) = \frac{z - 1}{(z - 2)^2}$$

for a *causal* system. Draw a pole-zero diagram for the system, and indicate the region of convergence. Is the system stable? Why?

2. (5 marks) Consider the system function

$$H(z) = \frac{z - 1}{(z - 2)^2}$$

for a *causal* system. Using the power series method, find the first five values of the causal discrete-time impulse response of the system.

3. (6 marks) Consider the system function

$$H(z) = \frac{z - 1}{(z - 2)^2}$$

for a *causal* system. Using the z-transform pair

$$n a^n u[n] \xleftrightarrow{z} \frac{a z^{-1}}{(1 - a z^{-1})^2}, \quad |z| > |a|$$

and the property

$$x[n - n_0] \xleftrightarrow{z} z^{-n_0} X(z),$$

find a closed-form expression for the impulse response $h[n]$.

4. (4 marks) Consider the system function

$$H(z) = \frac{z - 1}{(z - 2)^2}$$

for a *causal* system. Find a difference equation (relating the input $x[n]$ to the output $y[n]$) for the system.

5. (6 marks) Consider the system function

$$H(z) = \frac{z - 1}{(z - 2)^2}$$

for a *causal* system. Use graphical arguments to find the magnitude and phase of the frequency response of the system for $\omega = \pi/2$ and $\omega = \pi$.

6. (4 marks) Consider the system function

$$H(z) = \frac{z - 1}{(z - 2)^2}$$

for a *causal* system. Use $H(z)$ directly (algebraically) to find the magnitude and phase of the frequency response of the system for $\omega = \pi/2$.