

TEL 311E – Homework 5

Due 06.12.2010

1. Let a causal, LTI system satisfy the difference equation

$$y(n) - 3y(n-1) = x(n) + \left(3 - \frac{2}{3}\right) x(n-1) - 2x(n-2).$$

- (a) Find the system function $H(z)$ associated with this function.
- (b) Find the impulse response of the system.
- (c) Is the system stable? Please explain your answer.
- (d) Find the expression for a minimum-phase system $H_1(z)$ and an all-pass system $H_{ap}(z)$ such that

$$H(z) = H_1(z) H_{ap}(z).$$

2. Consider an LTI system whose impulse response is

$$\left(\frac{2}{3}\right)^n u(n) - \left(\frac{1}{2}\right)^n u(n-1).$$

Find the difference equation associated with this system.

3. Consider a sequence $x(n]$, whose z -transform is

$$X(z) = \frac{1 - 5z^{-1} + 6z^{-2}}{1 - \frac{1}{4}z}.$$

For which values of α , is $\alpha^n x(n)$ minimum-phase?