EE310 - Signals and Systems

Lecture 11 - Problems

Department of Electrical Engineering
Lahore University of Management Sciences, Lahore

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Problems

- 2.13

Consider a discrete-time system with impulse response

$$h[n] = \left(\frac{1}{5}\right)^n u[n]$$

(a) Determine A such that $\delta[n] = h[n] - A\,h[n-1]$.

(b) Determine the impulse response $g[n]$ of the system which is the inverse of the system with impulse response $h[n]$.

Problems

- 2.28, 2.29

Following are the impulse responses of the continuous-time or discrete-time systems. Determine which of the following systems are causal/or stable.

System	Stable	Causal
$h[n] = (0.8)^n\, u[n+2]$		
$h[n] = (0.5)^n\, u[-n]$		
$h[n] = (-0.5)^n\, u[-n] + (1.01)^n\, u[n-1]$		
$h(t) = e^{-6t}u(3-t)$		
$h(t) = e^{-\lvert t\rvert}$		
$h(t) = te^{-t}u(t)$		

Problems

- 2.43

Consider two systems connected in series with impulse responses $h_1[n]$ and $h_2[n]$ given by

$$h_1[n] = \sin 8n,$$

$$h_2[n] = \alpha^n \, u[n].$$

Determine the output $y[n]$ for the following input

$$x[n] = \delta[n] - \alpha\delta[n-1]$$

Problems

- 2.48 (True or False)

(a) If impulse response $h(t)$ of the systems is periodic and non-zero, the system is unstable.

(b) The inverse of causal LTI system is always causal.

(c) If impulse response $h[n] \leq K, \forall n$, the system is stable.

(d) If DT LTI system has the impulse response of finite duration, the system is stable.

(e) Causality implies stability.

(f) Cascade (series) of non-causal system with a causal one is necessarily non-causal.