Assignment - 1

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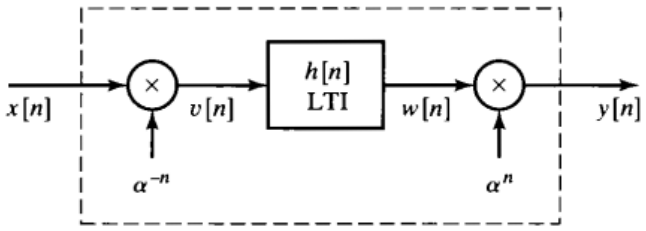

***Abstract*—This document contains the solution to Exercise 3.41 (c) of Oppenheim.**

Problem 1. In the following fig =, $h[n]$ is the impulse response of the LTI system within the inner box. The input to system $h[n]$ is $v[n]$, and the output is $w[n]$. The z-transform of $h[n]$, $H(z)$, exists in the following region of convergence:

$$0 < r_{min} < |z| < r_{max} < \inf$$

Can the overall system be BIBO stable? If so, determine inequality constraints relating α, r_{min}, and r_{max} such that it is stable. If not, briefly explain why.

Solution: with $G(z)$ as the system function defined as $G(z) = H(z/\alpha)$ and $g[n] = \alpha^n h[n]$.
The ROC of $G(z)$ is $\alpha r_{min} < |z| < \alpha r_{max}$. We want $r_{min} < 1/\alpha$ and $r_{max} > 1/\alpha$ for the system to be stable.