

Boundedness and Stability of Solutions in Nonlinear Difference Equation

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Abstract

We use Lyapunov functionals combined with Z- transform and obtain boundedness and stability results regarding the solutions of the nonlinear difference equation

$$y(n+1) = A(n)y(n) + f(y) + \sum_{s=0}^n C(n,s)h(y(s)) + p(n)$$

where A , and p are scalar sequences. In addition $C : \mathbb{Z}^+ \times \mathbb{Z}^+ \rightarrow \mathbb{R}$ where \mathbb{Z}^+ denotes the set of all natural numbers and \mathbb{R} is the set of reals. Throughout the paper we make the assumptions that for positive constants λ_1, λ_2 and M such that

$$|f(y)| \leq \lambda_1|y| \quad (1)$$

$$|h(y)| \leq \lambda_2|y| \quad (2)$$

$$|p(n)| \leq M \text{ for all } n \geq 0. \quad (3)$$