Bounded and stable solutions for nonlinear second order neutral difference equation

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Abstract: Using the techniques connected with the measure of noncompactness we investigate the neutral difference equation of the following form

$$\Delta\left(r_n\left(\Delta\left(x_n+p_nx_{n-k}\right)\right)^{\gamma}\right)+q_nx_n^{\alpha}+a_nf(x_{n+1})=0,$$

where $x:\mathbb{N}_k\to\mathbb{R}$, $a,p,q:\mathbb{N}_0\to\mathbb{R}$, $r:\mathbb{N}_0\to\mathbb{R}\setminus\{0\}$, $f\colon\mathbb{R}\to\mathbb{R}$ is continuous and k is a given positive integer, $\alpha\geq 1$ is a ratio of positive integers with odd denominator, and $\gamma\leq 1$ is ratio of odd positive integers; $\mathbb{N}_k:=\{k,k+1,\dots\}$. Sufficient conditions for the existence of a bounded or stable of a special type solution are presented.