Abstract

The main goal of this thesis is to investigate the boundedness, invariant intervals, semi-cycles and global attractivity of all nonnegative solutions of the equation

\[ x_{n+1} = \frac{\beta x_n + \gamma x_{n-k}}{A + B x_n + C x_{n-k}}, \quad n = 0, 1, 2, \ldots \]

where the parameters \( \beta, \gamma, A, B \) and \( C \) and the initial conditions \( x_{-k}, x_{-k+1}, \ldots, x_0 \) are non-negative real numbers, \( k = \{1, 2, \ldots \} \).

We give a detailed description of the semi-cycles of solutions, and determine conditions that satisfy the global asymptotically stable of the equilibrium points.

In particular, this monograph is a generalization of the rational difference equation that was investigated in [13].