Dynamics of Continuous, Discrete and Impulsive Systems
Series **A:** *Mathematical Analysis* **31 (2024)** 367-376
 http://www.watam.org

ON THE $P-$DIMENSIONAL SYSTEM OF NONLINEAR DIFFERENCE EQUATIONS: $(K+2)-$PERIODIC SOLUTIONS AND CONVERGENCE

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Abstract. We extend a thrilling result on the convergence of positive solutions to a $p-$dimensional system of nonlinear difference equations, which can also be considered as an extension of the one presented by Şimşek and Abdullayev (Journal of Mathematical Sciences, 2018, 234(1), $73-81$).

Keywords. Convergence; Periodic solution; System of nonlinear difference equations.

AMS (MOS) subject classification: 39A05, 39A10 and 40A05.

1 Introduction

In recent years, the study of systems of nonlinear difference equations have been increasing continuously. (see, [3]-[8], [24], [25], [31]). This is due to the truth that the systems of nonlinear difference equations appear as mathematical models that describe many real-life situations in biology, physics, stochastic time series, economics, probability theory, etc. (see, [2], [9]-[12], [18]-[23], [26], [30]-[32]). Among these systems is the rational system of difference equations, which get a lot of attention for the periodic nature and the global asymptotic behavior of all positive solutions, [13]-[17], [28], [34]. On the other hand, we can see that the system of difference equations is a natural extension of the difference equation, an example of this is the open problem that Stević [32] solved, for the following equation $x_{n+1}^{(1)} = x_{n-1}^{(1)} \Big/ g\left(x_n^{(1)}\right)$, $x_{-i}^{(1)} > 0$, $i = 1, 2$, $n \in \mathbb{N}_0$, when the function g satisfies some regularity conditions, which has been developed by Şimşek et al. [29], [30] and [31], for higher-order, $x_{n+1}^{(1)} = x_{n-(2k+1)}^{(1)} \Big/ \left(1 + x_{n-k}^{(1)}\right)$, $x_{n+1}^{(1)} = x_{n-(4k+3)}^{(1)} \Big/ \left(1 + x_{n-k}^{(1)} x_{n-(2k+1)}^{(1)} x_{n-(3k+2)}^{(1)}\right)$