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ON STRONG λ-CONVERGENCE OF ORDER γ FOR DIFFERENCE SEQUENCES OF FRACTIONAL ORDER WITHIN q-RUNG ORTHOPAIR FUZZY NORMED SPACES

Nesar Hossain

Department of Basic Science and Humanities
Dumkal Institute of Engineering and Technology
West Bengal-742406, India.
(E-mail: nesarhossain24@gmail.com)

and

Rahul Mondal†

Department of Mathematics, Vivekananda Satavarshiki Mahavidyalaya
Manikpara, Jhargram -721513, West Bengal, India.
(E-mail: imondalrahul@gmail.com; rahulmath@vsm.org.in)

Abstract. In this paper, we introduce the notion of strongly λ-convergence of order γ $(0 < \gamma \leq 1)$ for difference sequences of fractional order ($(\mathcal{S}, \mathcal{T})^{\gamma}_{\lambda}[\Delta^{\alpha}]$-convergence) within q-rung orthopair fuzzy normed spaces. Fundamental properties of this convergence are established, including the uniqueness of limits and an algebraic characterization. We further derive a criterion for subsequences, investigate the relation between $(\mathcal{S}, \mathcal{T})^{\gamma}[\Delta^{\alpha}]$-convergence and $(\mathcal{S}, \mathcal{T})^{\gamma}_{\lambda}[\Delta^{\alpha}]$-convergence, and present a significant inclusion result involving an auxiliary sequence $\{\rho_n\}$ and $0 < \gamma \leq \beta \leq 1$ under suitable condition. In addition, the concept of a strongly λ-Cauchy sequence of order γ for difference sequences of fractional order is introduced and its connection with $(\mathcal{S}, \mathcal{T})^{\gamma}_{\lambda}[\Delta^{\alpha}]$-convergence is explored.

†Corresponding author
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