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EXISTENCE AND UNIQUENESS RESULTS OF FUZZY HILFER FRACTIONAL LANGEVIN EVOLUTION EQUATIONS

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Abstract. In this paper, we investigate the existence and uniqueness of solutions to a class of fuzzy Hilfer fractional Langevin evolution equations employing the (α, β) resolvent operator as well as two alternative fixed point theorems. The mild solution to fuzzy Hilfer's fractional Langevin equation has been obtained. An example is given as well to demonstrate the final outcomes.

Keywords. Langevin evolution equations, Hilfer fractional derivative, Hukuhara differentiability, Krasnoselskiis Fixed Point, Banach fixed point.

AMS (MOS) subject classification: 34K36, 03E72, 34K36, 34A12.

1 Introduction

Fractional calculus has lately achieved growing popularity and relevance Because of its extensive applications in a variety of sectors. Leibnitz found fractional derivatives in 1695, and since that time, an increasing amount of academics have committed attention to the investigation of fractional calculus. The RiemannLiouville (RL) and the Caputo definitions are two of the most frequently utilized fractional calculus formulations [9, 10, 11]. Since Hilfer [6] researched fractional time development in physical phenomena, he provided an extension of the two types of RL and Caputo derivatives, which many writers refer to as the Hilfer fractional derivative [12].

In the last decade, fuzzy research and fuzzy differential equations have been offered as solutions to the unpredictability caused by inadequate expertise in different science frameworks that predict situations in reality [13, 14, 17, 18, 19, 20].

The idea of fuzzy RL differentiability founded on Hukuhara differentiation was proposed in [15, 16], and the researchers studied the availability of results for certain fuzzy integral problems utilizing the Hausdroff metrics for noncompactness. Bed et al [2] established and investigated novel extended differentiation ideas for fuzzy value functions according to Hukuhara differentiation.