



Local Existence and Uniqueness of Solution for Hilfer-Hadamard Fractional Differential Problem

D. B. Dhaigude and Sandeep P. Bhairat *

*Department of Mathematics, Dr. Babasaheb Ambedkar Marathwada University,
Aurangabad-431004 (M.S.) India.*

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Abstract: This paper deals with the local existence and uniqueness results for the solution of fractional differential equations involving Hilfer-Hadamard fractional derivative. Using Picard's approximations and generalizing the restrictive conditions imposed on nonlinear function, the iterative scheme for uniformly approximating solution is constructed. An example is given to illustrate the main results.

Keywords: *Picard iterative technique; fractional differential equation; convergence.*

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1 Introduction

Fractional differential equations (FDEs) occur in control of dynamical systems, physical and biological sciences, see for details [14, 19, 23] and references therein. Nowadays, many people have given attention to the existence theory of nonlinear FDEs of various types [2–13, 15–18, 21, 22]. Recently, existence and uniqueness of weak solutions for some class of Hilfer-Hadamard and Hilfer fractional differential equations are obtained in [1]. Further, some attractivity and Ulam stability results are obtained [1] by applying the fixed point theory, also one can see [12, 20].

Kassim and Tatar [16] obtained the well-posedness of Cauchy-type problem

$$\begin{cases} {}_H\mathcal{D}_{a^+}^{\alpha,\beta} x(t) = f(t, x), & t > a > 0, \\ {}_H\mathcal{J}_{a^+}^{1-\gamma} x(a) = c, & \gamma = \alpha + \beta(1 - \alpha), \end{cases} \quad (1)$$

* Corresponding author: <mailto:sandeepb7@gmail.com>