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ANALYSIS ON IMPULSIVE FRACTIONAL DIFFERENTIAL EQUATIONS INVOLVING HILFER FRACTIONAL DERIVATIVE AND ALMOST SECTORIAL OPERATORS

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Abstract. In this manuscript, we establish the existence results of impulsive fractional differential equations involving Hilfer fractional derivative and almost sectorial operators by using Schauder fixed point theorem . For this purpose, we have discussed the two cases if associated semigroup is compact and noncompact respectively. We also discuss an example to verify the main results.

Keywords. Hilfer fractional derivative; Mild solutions; Impulsive conditions; Almost Sectorial Operators; Measure of non-compactness.

Mathematical subject classification: Primary 26A33; Secondary 34A12; 34K40; 47H08.

1 Introduction

We consider the following impulsive fractional differential equations involving Hilfer fractional derivative and almost sectorial operators

$$\mathfrak{D}^{\chi,\varkappa}\wp(t) + \mathscr{A}\wp(t) = \mathscr{E}(t,\wp(t)) \quad t \in (0,T] = \mathcal{J} \tag{1}$$

$$\Delta\wp|_{t=t_k} = \mathscr{I}_k(\wp(t_k^-)), k = 1,2,3,...,m \tag{2}$$

$$I_{0+}^{(1-\lambda)(1-\varkappa)}\wp(0) = \wp_0, \tag{3}$$

where $\mathfrak{D}_{0+}^{\chi,\varkappa}$ Hilfer fractional derivative of order $\chi \in (0,1)$ and type $\varkappa \in [0,1]$ and $\mathscr{A}$ is an almost sectorial operator in $\mathscr{Y}$ having norm $\|\cdot\|$ and $\Delta\wp|_{t=t_k}$ denotes the jump of $\wp(t)$ at $t = t_k$, i.e., $\Delta\wp|_{t=t_k} = \wp(t_k^+) - \wp(t_k^-)$, where $\wp(t_k^+)$ and $\wp(t_k^-)$. $\mathscr{I}_k : \mathscr{U} \to \mathscr{D}(\mathscr{L})$ and $\wp_0 \in \mathscr{D}(\mathscr{L})$.
$\mathscr{E} : \mathcal{J} \times \mathscr{Y} \to \mathscr{Y}$ is a function which is defined later.