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# Mild Solution for Impulsive Neutral Integro-Differential Equation of Sobolev Type with Infinite Delay

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**Abstract:** In this work, we consider an impulsive neutral integro-differential equation of Sobolev type with infinite delay in an arbitrary Banach space $X$. The existence of mild solution is obtained by using resolvent operator and Hausdorff measure of noncompactness. We give an example based on the theory and provide the conclusion at the end of the paper.

**Keywords:** *resolvent operator; impulsive differential equation; neutral integro-differential equation; measure of noncompactness.*

**Mathematics Subject Classification (2010):** 34K37, 34K30, 35R11, 47N20.

## 1 Introduction

In our recent work [19], we have studied the impulsive neutral integro-differential equation with infinite delay in a Banach space $(X, \| \cdot \|)$,

$$\frac{d}{dt}[u(t) - F(t, u_t)] = A[u(t) + \int_0^t f(t-s)u(s)ds] + G(t, u_t, \int_0^t \mathcal{E}(t, s, u_s)ds),$$
$$t \in J = [0, T_0],\ t \neq t_k,\ k = 1, 2, \cdots, m, \quad (1)$$
$$u_0 = \phi \in \mathfrak{B}, \quad (2)$$
$$\Delta u(t_i) = I_i(u_{t_i}),\ i = 1, 2, \cdots, m, \quad (3)$$

where $0 < T_0 < \infty$, $A$ is a closed linear operator defined on a Banach space $(X; \| \cdot \|)$ with dense domain $D(A) \subset X$; $f(t), t \in [0, T_0]$ is a bounded linear operator. The functions $F : [0, T_0] \times \mathfrak{B} \to X$, $G : [0, T_0] \times \mathfrak{B} \times X \to X$,

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