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EXISTENCE RESULTS FOR IMPULSIVE FUNCTIONAL DIFFERENTIAL INCLUSIONS

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Abstract. In this paper we prove existence results for first and second order impulsive functional and neutral functional differential inclusions in Banach spaces.

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1 Introduction

In this paper we prove existence results for initial value problems for first and second order impulsive functional differential inclusions. First, in Section 3 we study first order impulsive functional differential inclusions of the form

$$y'(t) \in F(t, y_t), \quad \text{a.e. } t \in J := [0,T],\ t \neq t_k,\ k = 1, \dots, m, \tag{1}$$

$$\Delta y|_{t=t_k} = I_k(y(t_k^-)),\ k = 1, \dots, m, \tag{2}$$

$$y(t) = \phi(t), \quad t \in [-r, 0], \tag{3}$$

where $F : J \times \mathcal{D} \to \mathcal{P}(E)$ is a multivalued map, $\mathcal{D} = \{\psi : [-r,0] \to E \mid \psi$ is continuous everywhere except for a finite number of points s at which $\psi(s)$ and the right limit $\psi(s^+)$ exist and $\psi(s^-) = \psi(s)\}$, $\phi \in \mathcal{D}$, $(0 < r < \infty)$, $0 = t_0 < t_1 < \ldots < t_m < t_{m+1} = T$, $I_k \in C(E, E)$ $(k = 1, 2, \dots, m)$, E a real separable Banach space with norm $|\cdot|$ and $\mathcal{P}(E)$ is the family of all subsets of E.

For any continuous function y defined on the interval $[-r, T] \setminus \{t_1, \dots, t_m\}$ and any $t \in J$, we denote by y_t the element of $\mathcal{D}$ defined by

$$y_t(\theta) = y(t + \theta), \quad \theta \in [-r, 0].$$