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EXISTENCE OF SOLUTIONS FOR SEMILINEAR NEUTRAL IMPULSIVE MIXED INTEGRODIFFERENTIAL INCLUSIONS OF SOBOLEV TYPE IN BANACH SPACES

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Abstract. In this paper, the existence of mild solutions for semilinear neutral impulsive mixed integro-differential inclusions of Sobolev type with nonlocal initial conditions is proved. The results are obtained by using fixed point theorem for multivalued maps on locally convex topological spaces. An example is provided to illustrate the theory.

Keywords. Existence, differential inclusion, neutral integrodifferential equation, impulsive differential equation, convex multi-valued map, fixed point theorem.

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1 Introduction

Mathematically, many systems and processes in applied science and engineering are modeled by ordinary/partial differential equations and inclusions that describe the underlying physics. The quantity of primary importance is not the full field variable, but rather certain selected outputs defined as functionals of the field variable. Typical outputs include energies, and forces, critical stresses or strains, pressure drops, temperature and flux. These outputs are functions of system parameters, or inputs, that serve to identify a particular configuration of the component or system; these inputs typically reflect geometry, properties, initial, boundary conditions and loads. The input-output relationship thus encapsulates the behavior relevant to the desired engineering context. However its evaluation demands solution of the underlying ordinary and partial differential equation. Engineering design and optimization require thousands of input-output evaluations in real time. Popular models essentially fall into two categories: the differential models and the integrodifferential models. Our work centers around the problems described by the integrodifferential models. Several authors [3, 9, 22, 27] have investigated the integrodifferential equations in abstract spaces. Also the problem of controllability of integrodifferential systems including delays has been studied by many researchers [24, 25].