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CONTROLLABILITY AND PERIODICITY RESULTS FOR NEUTRAL IMPULSIVE EVOLUTION SYSTEM IN BANACH SPACES

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Abstract. This paper establishes the controllability as well as periodicity results of neutral impulsive evolution system. Controllability results are obtained by using analytic semigroup theory and Sadovskii fixed point theorem. Also, the mild solution of the same system was extended to almost periodic ($\mathcal{AP}$) and asymptotically almost periodic ($\mathcal{AAP}$) solutions. Moreover, uniqueness of asymptotically almost periodic ($\mathcal{AAP}$) solutions are implemented to the governing control system. An example is provided to illustrate our results.

Keywords. Controllability, Neutral evolution system, Impulsive differential system, almost periodic, asymptotically almost periodic.

AMS (MOS) subject classification: 93B05, 11K70, 34K40.

1 Introduction

Asymptotic behavior of evolution equations is a well-studied area in the theory of abstract differential equations with various method of studies. It is natural to use the well-known ideas and techniques in the finite dimensional case as much as possible to deal with the problems in the infinite dimensional case. The concept of almost periodic was introduced in the literature by Bohr [2] in 1955 in the context of differential geometry. Since then, this concept has been extended in various directions. Veech [24] extended this concept to groups and then obtained various properties of these functions including the existence of their corresponding Fourier series. The notion of almost periodicity, which generalizes the concept of periodicity, plays a crucial role in various fields including harmonic analysis, physics, and dynamical system. From the point of view of applications, motions of dynamical systems are naturally divided on transitional (non stabilized) and stabilized. By transitional we mean the motions that under unlimited in censement of time asymptotically approach to some established motion, that is, a motion that possess some property of recurrence and stability. When we try to define a non stabilized motion exactly we come to the motion of the asymptotically stability in the sense of Poisson motion. Such motions are of interest for applications and are met, for instance, in systems possessing stable oscillatory regime (e.g., under the phenomenon of convergence).

Almost periodicity, as a structural property, is a generalization of pure periodicity and Bohr's original methods for establishing the fundamental results of