

# CHAPTER I

## INTRODUCTION

The theory of impulsive differential equations is an important branch of differential equations, which impulsive differential equations arise frequently in the modelling of several real world phenomena whose states are subjects to sudden change at certain moments. For instance in population dynamics subject to abrupt changes, in diffusion of chemicals, the spread of heart, the radiation of electromagnetic waves and so on. The theory of impulsive differential equations has been considerably developed by Bainove and Simeonov (1993), Yang (2001) and the bibliography cited therein.

The existence and uniqueness of periodic mild solutions for impulsive periodic control systems with parameter perturbation has been studied by Hinpang, Xiang and Sattayatham (2006), but the existence and uniqueness of periodic mild solutions for semilinear impulsive periodic systems with parameter perturbation

$$\begin{cases} \dot{x}(t) = A(t)x(t) + f(t, x(t)) + p(t, x(t), \xi), & t \neq \tau_k, \\ x(0) = x_0 \\ \Delta x(t) = B_k x(t) + c_k + q_k(x(t), \xi), & t = \tau_k, \end{cases} \quad (1.1.1)$$

where  $\Delta x(\tau_k) = x(\tau_k^+) - x(\tau_k^-)$  for all  $k \in \mathbb{N}$ ,  $A(t), t \in [0, T_0]$  is a closed densely defined linear unbounded operator on Banach spaces  $X$  have not been studied.

In this thesis, the existence, uniqueness of periodic solutions are systematically study for semilinear impulsive system (1.1.1) on infinite dimensional space, where the differential operator involved is the closed densely defined linear unbounded operator on Banach spaces  $X$  by we construct a new Poincare operator  $P$  for semilinear periodic system (1.1.1), then we show the continuity and compactness of Poincare operator  $P$  which are very important. By virtue of Gronwall lemma with impulse, the estimate of mild solutions is given. There-

fore, using fixed point theorem, the existence and uniqueness of  $T_0$ -periodic solutions for semilinear impulsive periodic system.

The thesis is organized as follows. Chapter II presents some basic concepts and results from functional analysis, integration theory and evolution equations that are necessary for the presentation of the theory in later chapters. Chapter III, the first section we introduce basic notations and basic assumptions, properties of impulsive evolution operator, in the second section, we study existence and uniqueness of periodic mild solutions and in the last section, we study the existence and uniqueness of  $T_0$ -periodic solutions for semilinear impulsive periodic systems with parameter perturbation. Chapter IV, we summary results of existence and uniqueness of mild solutions, and existence and uniqueness of periodic solutions which have been studied in this thesis.