CHAPTER V

Conclusions and Outlook

In this work, we consider the nonlinear differential system (3.14). When $-A$ is the infinitesimal generator of an analytic semigroup $S(t), t \geq 0$ satisfying the exponential stability. We prove the existence and uniqueness of classical PCAP solution and investigate whether or not the classical solution inherits uniform piecewise continuous almost periodicity from f and $J_i, i \in \mathbb{N}$. We propose a new method for proving existence whose main component is the use of fractional powers of operators. More precisely, we assume that $f : \Re \times X_\alpha \rightarrow X$ and $J_i : X_\alpha \rightarrow X, i \in \mathbb{N}$ satisfy the condition (JF). We successfully apply this method and use these assumptions to prove the existence and uniqueness of classical PCAP solution. For studying the behavior of the solution, we win to prove asymptotic stability. Beside the study of the solution and its properties, we give some examples (model of problem in the real world), examples of f and $J_i, i \in \mathbb{N}$ such that satisfying the condition (JF). Then we transform them to the abstract form and use our main result to conclude that these systems have a unique classical PCAP solution with asymptotic stability.

Last but not least we should be interested in developing this method and use weakly assumptions to prove the existence and uniqueness of classical PCAP solution a little further. Moreover, we should be interested in studying the others the solution behaviors for example;the super stable property. Even though it seems likely that efforts in this direction can be successful, there no guarantee for that. Therefore, we can only hope for the best, but have to expect the worst.