

Editorial

Compactness Conditions in the Theory of Nonlinear Differential and Integral Equations

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The concept of the compactness appears very frequently in explicit or implicit form in many branches of mathematics. Particularly, it plays a fundamental role in mathematical analysis and topology and creates the basis of several investigations conducted in nonlinear analysis and the theories of functional, differential, and integral equations. In view of the wide applicability of the mentioned branches, the concept of the compactness is one of the most useful in several topics of applied mathematics, engineering, mathematical physics, numerical analysis, and so on.

Reasoning based on concepts and tools associated with the concept of the compactness is very often used in fixed point theory and its applications to the theories of functional, differential, and integral equations of various types. Moreover, that concept is also applied in general operator theory. It is worthwhile mentioning several types of operators defined with help of the compactness, both in strong and in weak topology.

This special issue is devoted to discussing some aspects of the above presented topics. We focus here mainly on the presentation of papers being the outcome of research and study associated with existence results concerning nonlinear differential, integral or functional differential, and functional integral equations. We describe roughly the results contained in the papers covering this special issue.

One of those results, contained in the paper of Q. Li and Y. Li, is concerned with the existence of positive periodic solutions of a second-order functional differential equation with

multiple delay. The investigations concerning that equation are located in the space of real functions defined, continuous and periodic (with a fixed period) on the real line. The main tool used in the proofs is the fixed point index theory in cones.

The paper of C. Lizama and J. C. Pozo presents also existence results and is devoted to proving the existence of mild solutions of a semilinear integrodifferential equation in a Banach space. The arguments used in the study are based on theory of semigroups and the technique of measures of noncompactness.

The paper by Z. Liu et al., which we are going to describe briefly, discusses existence results for an integral equation of Volterra type. The authors of that paper used some special measure of noncompactness and the fixed point theorem of Darbo type to obtain a result on the existence of asymptotic stable solutions of the equation in question.

A review article concerning infinite systems of differential equations in the so-called BK spaces presents a brief survey of existence results concerning those systems. The authors, M. Mursaleen and A. Alotaibi, present results obtained with help of the technique of measures of noncompactness.

In this special issue two research articles concerning the existence of solutions of nonlinear fractional differential equations with boundary value problems are included. The paper authored by Y. Zhao et al. discusses a result on the existence of positive solutions of a nonlinear fractional integrodifferential equation with multipoint boundary value problem. The investigations are conducted in an ordered