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Nonlinear Partial Differential Equations with Applications

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Partial differential equations belong to those mathematical topics which display both of the features making a field of mathematics attractive. They are supported by a background of a rich classical theory, and they are able to offer always something new and original. The referred book confirms both these properties in a very successful way.

After a *Preface, Notational conventions* and *Preliminary general material* containing brief summary of the key-concepts of functional analysis and function spaces, the main text is divided into two parts.

The first part, named *Steady-State Problems* includes five chapters. The first of them is devoted to *Pseudomonotone and weakly continuous mappings* including also some special results regarding, e. g., quasilinear elliptic equations or weakly continuous semilinearity. The next chapter, *Accretive mappings*, deals mostly with problems related to applications. The following two chapters, *Potential problems: smooth case* and *Nonsmooth problems; variational inequalities* are sufficiently characterized by their headings. Finally, the last chapter of the first part, *Systems of equations: particular examples*, deals with fundamental concepts and several significant types of systems of equations (e. g., variational method, or models of viscous flow, diffusion or semiconductors).

The second part, *Evolution Problems* is divided into six chapters. The first one of them presents the *Special auxiliary tools* of the theory, some of the others are free counterparts of analogous chapters in the first part. (Namely, chapter 8: *Evolution by pseudomonotone or weakly continuous mappings*, chapter 9: *Evolution governed by accretive mappings*, and also chapter 12: *Systems of equations: particular examples*). The remaining two chapters, *Evolution governed by certain set-valued mappings*, and *Doubly-nonlinear problems* complete the topic of the second part in an adequate way.

The remarkable width of topics included into the book is organized in a very lucid and synoptical style. All chapters have a uniform structure – they start by a brief general section followed by several applied topics, and they are concluded by examples (except those chapters whose sections themselves are treated as examples). Most sections are completed by exercises and bibliographical remarks. The list of *References* concluding the volume is representative and sufficiently rich (357 items). The *Index* simplifies the orientation in the text.

The referred book is exceptionally well written. Not only the organization of chapters but also the presentation of the general, as well as applied, theory is clear, logical and formally correct. Evident homogeneity and consistency of particular chapters and of the complete book, as well, is a natural consequence of the author's respect to the main idea of the book – to display, on the background of abstract theory, the width and flexibility of its applications.

The result of this endeavor is a clear and correct survey which can be recommended to advanced students of mathematics, as well as to specialists in both – the partial differential equations theory, and in other fields in which good knowledge of this theory is desirable.

Even if the book is addressed rather to specialist having the fundamental knowledge of differential equations, its style and the organization of particular chapter make it useful and inspirational also for advanced students and for university teachers of calculus in more advanced courses. The combination of abstract theory and non-trivial applications is the best way to motivate gifted students for intensive interest in this field of mathematics.

Milan Mareš