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Generalized Concavity in Fuzzy Optimization and Decision Analysis

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The optimization and decision-making procedures and their modifications belong to the fundamental topics of the advanced applied mathematics. It follows from the essential properties of these problems that convex set of feasible alternatives and concave (eventually also convex) objective functions play an exceptional role in the formulation and solvability of the mentioned optimization problems. There exist numerous important results based on the pure convexity and concavity. One of the significant problems to be solved is to extend these results to a wider class of models in which the convexity and concavity are substituted by some rather modified and, hence, generalized concepts in some sense similar to the classical ones. The presented book represents an interesting and useful contribution to this trend, and it is to be stressed that it contributes to the topic in an excellent way.

The text of the book is divided into ten chapters which are grouped into two parts. The first one includes, besides *Preliminaries*, the theoretical models and results. They start with several approaches to the *Generalized Convex Sets*, including sections devoted to starshaped sets and their modification. Chapter on *Generalized Concave Functions* follows and it is focused on such topics like starshaped functions, quasiconnected functions, differentiable functions, pseudoconcave functions and some others. These chapters are followed by a brief but essential survey of *Triangular Norms and T-Quasiconcave Functions*, their properties and representation. The next chapter is focused on *Aggregation Operators*, their basic properties and continuity, averaging aggregation operators, Sugeno and Choquet integrals and also the concept of aggregation of functions. The last chapter of the first part deals with the presentation of *Fuzzy Sets* and other concepts related to them, like fuzzy relations, fuzzy numbers and others.

The second part of the book is devoted to four chapters on the applications of the above theoretical concepts. They deal with *Fuzzy Multi–Criteria Decision Making* especially focused on fuzzy criteria, their aggregation, their extreme properties, compromise decisions and some other related topics. The next chapters deal with *Fuzzy Mathematical Programming* and its properties and *Fuzzy Linear Programming* including duality, properties of solution and several special models. The last chapter of the second part is oriented to *Fuzzy Sequencing and Scheduling* including its deterministic and stochastic versions. The book is completed by the list of symbols, the Index and a representative (139 items) list of references.

Both, the theoretical and the applied parts are very well written with full respect to mathematical exactness as well as to the readability and understandability of the text. The organization of chapters and sections is logical, and it supports the reader's understanding of the relations between particular topics.

The referred book represents a valuable contribution to mathematical processing of uncertainty of different type existing in the optimization and decision-making models. It covers certain gap existing in this field of study, and it can be recommended as a useful source of knowledge and inspiration for everybody who is interested in a precise survey of the approaches and results achieved in the relevant part of mathematics.

Milan Mareš