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PROGRAMAREA NELINIARĂ

(Nonlinear Programming)

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The publication of this work is filling in a gap which has long been felt in the literature of speciality in the field of mathematical programming. The work is meant for a wide circle of specialists in various fields-mathematicians, engineers, economists, etc. — who, in their activity, are facing the situation of applying mathematical methods in the efficient solution to practical or research problems.

The accessibility of the presented material — without the way of treatment losing something of its rigour — causes the study to come in support of the students for whom mathematical programming forms a subject of study.

Being conceived as a summarized exposition of nonlinear programming, the work contains the theoretical results — definitions, lemmas and theorems — as well as a wide range of problems proposed for solution to readers.

The book is divided into four chapters.

The first chapter is devoted to the study of multitudes and of the convex and generalized convex functions. A special place in this chapter is occupied by the Farkas-Minkovski type lemmas, by the local and general properties of quasi-convex, strictly-quasi-convex, pseudo-convex, strict convex, logarithmic convex and concave functions.

The second chapter is dealing with two fundamental problems of nonlinear programming, namely the extreme conditions and duality.

The necessary or sufficient conditions for the existence of the local extreme are dwelt on separately for the two big classes of problems, just as the functions defining the programme are or not differential. In this connection, the conditions of a "saddle point" type — conditions without differentiability — Kuhn and Tucker, Uzawa and Karlin, are presented.

As in the approach to the necessity of the saddle point type conditions for the regularity of restrictions are required besides the convexity of functions, the authors define Staler's regularity condition, Karlin's regularity condition and the strict regularity condition as well as the relationship between these regularity conditions.

The problem of the vectorial extreme or the probleme of the efficient points is defined and the conditions of v-extreme and the problem of minimum of Kantorovici's maximum are also considered.

In connection with the extreme differential condition, the conditions of the Lagrange-Kuhn-Tucker type for optimality are given, particular importance being granted to the hypotheses in the case of the necessity of the conditions.

In this chapter, setting out from the importance of the place occupied by duality in mathematical programming, after reviewing the pairs of dual programmes in linear programming, the authors define duality in nonlinear programming, defining its essential properties.

The third chapter dwells on digit methods in nonlinear programming. The authors first present the classical methods for establishing the points of free and conditioned local extreme as well as the Theil-Van de Panne method for minimizing the convex square functions in the case of restrictions given by equalities. The properties of the generalized inverse and the extreme properties of the values and the elements of a square form matrix are being reviewed.

The Theil-Van de Panne algorithm, the Hildreth d'Esopa algorithm and the short and long form of Wolfe's algorithm are dealt with in connection with the square programming. The description of each algorithm is followed by a solved example, significant for its way of application.

Further, the Geoffrion algorithm for solving bi-criterion programmes is presented, the objective function being bi-dimensional vectorial and the extension of the results for multi-criterion programmes. Pseudo-linear and pseudo-square programmings are especially dwelt on.

After presenting the polynomial programming, the authors approach the gradient methods in general convex programming, three variants of the gradient methods being presented: the method of admissible directions, the methods of the most rapid decrease and the method of the planned gradient; the case of linear restrictions is tackled separately in the last but one case, and in the last case — only for this sort of restrictions.

The last chapter is devoted to the demonstrations and solutions to the problems in the previous chapters.

The work also contains the original results of the authors in the field of nonlinear programming.

The importance of the work for the reader is increased also through the fact that the authors present a rich reference material in connection with the tackled subject.

In conclusion, we consider the work "Nonlinear Programming "by M. Dragomirescu and M. Maliţa a valuable and useful work. For this reason, we warmly recommend it to all those are preoccupied by the problems of mathematical programming.

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