

## Optimization Methods in Operations Research and Systems Analysis

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*Optimization Methods in Operations Research and Systems Analysis*

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1996, pp. 385+xviii, Rs. 135.

This book discusses various optimization techniques and can be used profitably as a good text by science and engineering students at the post-graduate level. This third edition is a remarkable improvement over its first edition which appeared in 1976.

The first two chapters cover some mathematical topics which are not always taught in undergraduate classes, but are necessary for the understanding of subsequent chapters. They include, among others, vector-spaces, convex sets, and constrained extrema of functions. Chapter three deals with various aspects of linear programming (L.P.) like simplex method, revised simplex method, duality and dual simplex method. Chapter four devotes itself to the important particular cases of L.P., viz., transportation and assignment problems. Chapter five discusses those L.P. problems for which graph theory can be used for solution, i.e., flow and potential in networks. Chapter six presents cutting plane, and

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branch and bound methods for integer programming problems. Chapter seven discusses sensitivity analysis with respect to L.P. and gives very brief ideas about goal programming and multiobjective linear programming. Chapter eight deals with Kuhn-Tucker theory and nonlinear programming covering only quadratic and separable programming. The ninth and tenth chapters are devoted to geometric and dynamic programming respectively. If a problem cannot be formulated in any of the forms (linear, quadratic etc), discussed in earlier chapters, one can resort to direct search and gradient methods discussed in chapter eleven. Chapter twelve deals briefly with matrix games.

The book has two appendices. The first describes Karmarkar's algorithm for L.P. The second gives computer programs (developed at Roorkee University) written in FORTRAN IV for simplex, revised simplex, and dual simplex methods of L.P. and for nonlinear optimization by sequential search, along with illustrative examples. Bibliography and index are at the end. Almost all chapters have a historical note, bibliographical note, and a problem set. Answers to these problems are provided. A serious student (not examination-oriented) will be benefitted by these.

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Though not particularly innovative, the presentation of the matter is systematic and reasonable number of illustrative examples are included. The authors expect it to be a good text-book for students of mathematics, operations research, engineering, economics and management. But management and economics students will find it more mathematical and less practical; there are no case studies in the book. There should have been a full chapter on formulating the practical problems, as modelling aspect is gaining more significance with availability of good reliable software in this field.

Perhaps, transportation and assignment problems could have been discussed in their own right before the chapter on L.P. (and not as particular cases of L.P.), without using terms like basic feasible solution. Theorem 3 (page 127) is a basis for developing an algorithm for assignment problems. This is stated by the authors. Similar theorem, viz., optimum solution to a transportation problem remains unchanged if we add or subtract the same constant from any row or column of the unit transportation cost matrix, forms the basis of the algorithm for testing the optimality of a feasible solution to transportation problem. This should have been stated. Discussions like these give

insight into the method of solution. That assignment and transportation problems are particular cases of L.P. can be easily seen after the chapter on L.P.

It is stated that by addition of fictitious or dummy sources and destinations, unbalanced transportation problem can be converted to a balanced one. The authors should have brought out the fact that inventory and shortage costs can be used for dummy destinations and sources respectively to emphasize the connection of these problems to practical life. Practical inventory problems which can be formulated as transportation problems could have been included.

Karmarkar's method deserves a place in the main part, rather than the appendix, as this has opened up a new chapter in research in this area. Goal and multiobjective programming should have been discussed in detail. Difference between cost-assignment and time-assignment problems should have been brought out for better understanding and insight into assignment problems. To justify the title of the book, it is necessary to state somewhere, at least briefly, as to what is operations research and what is systems analysis.

Printing and get-up of the book are good.

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