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INTRODUCTION TO SYSTEMS ENGINEERING DETERMINISTIC MODELS

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FUNDAMENTALS OF SYSTEMS ENGINEERING. PROBABILISTIC MODELS

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The authors of these two volumes published in 1969 and in 1972 respectively, are professors at the Carnegie-Mellon University, U.S.A.

The notion "systems engineering" is defined as a way of unitary approach to decision problems occuring in the designing and exploitation of engineering systems. This discipline includes "operational research" whose sphere is generally limited to the optimization of the decisions occuring in the exploitation ("operation") of systems.

The first volume is dealing with deterministic models:

— methods of mathematical analysis;
— linear programming;
— graph analysis;
— problems of minimum cost of the flow;
— the analysis of the critical path;
— dynamic programming;
— competition optimization; games.

The second volume is mainly an introduction to the theory of probabilities. In this volume, the presentation of the fundamentals of mathematics is prevalent. The first chapter tackles the characteristics of decisions in conditions of incertitude, the general characteristics of the probabilistic models, possible applications and limitations.

The next two chapters present the concepts and basic applications of the theory of probabilities, followed by a systematic presentation of the theory of decisions.

Chapters 6 and 7 approach the method of selection.

In the last three chapters, the authors dwell on some applications of the theory of probabilities in the field of systems;

— the analysis of regression;
— fiability and safety;
— simulation by the Monte Carlo method.

Each chapter is preceded by a number of elementary examples of progressive dificulty which have the capacity to make the reader understand how the problem is put and to interest him in tackling the theoretical part of the chapter. The examples are selected with priority from the field of construction. Also out of the care for an easy assimilation of the material, the authors have marked those subchapters which

might be omitted at first reading, without making difficult the further reading of the book. Each chapter is followed by references containing a selection of the most representative works in the respective field and by an important number of problems of varied difficulty.

Each volume contains the results or even a detailed exposition of the solution to some of the problems proposed in each chapter.

The work is meant for students, especially for those of the faculties of engineering and for engineers attending various courses as part of the post-university improvement systems. As a matter of fact, the work represents a systematization and extension of the lectures held by the authors ever since 1962; this, on the spot, verification, by direct contact with the readers, which allowed the continuous polishing of the text, renders it a remarkable clarity and conciseness.

The work is valuable both for its accessibility and for its scientific strictness. Its high quality consists in the harmonious blending of these two characteristics, a quality which confers on it a special place within similar works printed in the world, in recent years.

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