N. Racoveanu

CALCULATOARE ELECTRONICE ŞI PROGRAMARE

(Electronic Computers and Programming)

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This book is the course which prof. Racoveanu has taught for several years at the Institute for Oil, Gas and Geology, at the Bucharest Polytechnical Institute and at the Academy of Economic Studies.

The particularly clear and systematic manner in which the profuse material concerning electronic computers and programming is presented should be stressed from the very beginning.

This work is made up of three parts, viz.: mathematical introduction, analog computers and digital computers.

The section dealing with the mathematical introduction begins with a chapter devoted to numerical analysis. In this section the author presents calculus with differences, interpolation formulae, the least square method, then passes on to methods for solving algebraic equations, systems of linear algebraic equations, methods regarding the reversing of matrices, derivation and numerical interpolation, as well as to the intergration of common differential equations and of equations with partial derivatives.

Chapter II deals with systems of numeration, numerical codes and the mode of representing numbers in the computer.

Chapter III deals with problems of mathematical logic. The notion of logical value is introduced and propositional calculus rules are given. Two binary variable functions are studied in detail, followed by the synthesis of sequential and combinational *logical circuits.*

The second section of this book deals with analog computers and begins by presenting the electric models of dynamic systems. The author then proceeds to the modelling of Laplace's equation by continuous media, passing on to electric circuits for equations with partial derivatives. He thus shows the manner in which Laplace's equation,

as well as other types of equations, such as the bi-harmonic equation, can be integrated. Stress is laid on the mode in which boundary conditions are achieved and the causes of errors when modelling by electric circuits are analyzed. Likewise, the application of the RC circuits method to the study of fluid flow through porous media — a problem to which the author devoted particular attention — is studied.

Chapter V deals with problems of the analog elements and computers: passive networks, potentiometer, operational amplifiers, generators of dependent variable functions — i.e. (limiters) with biased diodes, multipliers, dividers, generators and switching circuits.

The chapter ends with a synoptic presentation of the symbols used in the circuits of principle.

The application of analog computers is presented in a separate chapter. It is thus shown the manner in which linear and non-linear common differential equations are integrated as well as the following equations with partial derivatives: diffusion equation, wave equation, vibration of a string.

Methods for solving systems of linear and algebraic equations, and of effecting harmonic analysis are presented in greater detail. Methods for checking the solutions and for determining the errors are also shown.

A final paragraph shows the directions of development of analog computers.

The third section deals with digital computers.

It is particularly specified that a digital machine usually means an automatic unit operating with digits. The computer is an automatic machine by means of which problems of mathematical calculus are solved. By digital computer is understood a computing machine operating with discrete form signals (digits) that can correspond to numbers.

Logical circuits, i.e. circuits achieving the fundamental logical operators AND, OR, NO, NEITHER, are initially used. The manner in which such circuits can be achieved by means of transistors, transfluxers and cryotrons is shown.

Further, the registers, decoders and counters, as well as the input-output equipment are studied. The following are presented: memories with magnetic core, with ferro-electric core, cathode tubes, with delay lines, with magnetic recording. The control system is also studied.

The chapter ends with the presentation of trends in the conception and design of digital computers.

The last chapter — the VIIIth — is devoted to programming. The author presents notions of programming in connection with a hypothetical computer called DIDAC-1.

Prof. E. Nicolau