REVIEWS AND DESCRIPTIONS OF TABLES AND BOOKS

The numbers in brackets are assigned according to the revised indexing system printed in Volume 28, Number 128, October 1974, pages 1191–1194.

15[12.20].–PETER HENRICI, *Computational Analysis with the* HP-25 *Pocket Calculator*, Wiley, New York, 1977, xi + 280 pp., 23 cm. Price $11.50.

It might appear inappropriate to publish a review of a collection of programs for an obsolete pocket calculator, but this is not true. At a time when most interest is in algorithms which minimize the number of operations at the expense of program length and data storage, Henrici explores the domain of problems which can be solved with no more than eight data registers, a four-register stack, and a program of no more than 50 instructions. The choice of algorithm is further complicated by the fact that, like most pocket calculators, complicated functions like square root or the trigonometric functions and their inverses require the same number of program steps as an addition, and less than a two-digit constant. Although the possibilities are only indicated by example, the programs suggest a new criterion for computational complexity.

The programs solve problems from number theory(5), iteration(4), properties of polynomials(8), power series(3), integration (both quadrature and differential equations)(6), and special functions(10). Each program includes a statement of purpose, a discussion of the method, a flowchart, the program for the HP-25 with register allocations, operating instructions, and several examples with timings and results. These examples are often of considerable interest in themselves. The flowcharts are detailed enough to make programming for another calculator or computer relatively simple, even without a knowledge of the HP-25.

Almost all the programs and examples are based on methods developed in three of the author's books [1], [2], [3]. The major exception is in the programs for finding reciprocals, powers, and exponentials of formal power series, where storage limitations rule out the conventional algorithms.

Even with the increase in interactive time-sharing computer systems, many research workers and students may prefer the informality and convenience of a programmable calculator, at least for exploratory calculations. This is particularly so with the rapid increase in power for a given cost calculator. For such users, this collection of programs has much to offer. Many of the programs solve common practical problems, particularly when they are adapted to current calculators with much more storage than the HP-25. Some of the programs also illustrate the value of complex analysis in producing numerical results, and thus will provide good motivation for students of applied complex analysis, as well as a feeling for the

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domain of applicability of the techniques. The programs of this type might well be implemented on standard computers as well as on pocket calculators.

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1. P. HENRICI, *Elements of Numerical Analysis*, Wiley, New York, 1964.
2. P. HENRICI, *Applied and Computational Complex Analysis*, Vol. 1, Wiley, New York, 1974.
3. P. HENRICI, *Applied and Computational Complex Analysis*, Vol. 2, Wiley, New York, 1977.

16[5.10.3].–R. GLOWINSKI, E. Y. RODIN & O. C. ZIENKIEWICZ (Editors), *Energy Methods in Finite Element Analysis*, Wiley, New York, 1979, xviii + 361 pp., $23\frac{1}{2}$ cm. Price $43.95.

This volume is dedicated to Professor Fraeijs de Veubeke. A short biography of Professor Fraeijs de Veubeke is given at the beginning and a list of his main publications at the end.

The book contains nineteen chapters with thirty-three authors. The following description of its contents is taken from the editors' preface.

"Chapter 1, by J. T. Oden, gives the mathematical foundations of variational mechanics. It describes the various formulations existing for a given problem with a detailed discussion of the classical variational principles, the dual principles and their applications to elastostatics.

In Chapter 2, by P. G. Ciarlet and P. Destuynder, it is proved *without a priori assumptions*, that the classical two-dimensional linear models in elastic plate theory are indeed limits of the standard three-dimensional models of linear elasticity. This result is proved using variational formulations of the elastic problems and singular perturbation methods.

In Chapter 3, A. Samuelsson introduces the concept of 'global constant strain condition' to study non-conforming finite elements and shows its relationship to the well-known 'patch test'.

In Chapter 4, G. B. Warburton gives a survey of the recent developments in structural dynamics computational methods via finite elements. Modal methods and numerical integration methods are described with their main properties, and their use is discussed with many details.

In Chapter 5, by O. C. Zienkiewicz, D. W. Kelly, and P. Bettess, one studies how standard finite element methods and boundary integral methods can be coupled in order to solve, for example, boundary value problems on unbounded domains; various examples from fluid mechanics, electrotechnics, etc., illustrate the possibilities of this new class of methods.

The chapters from 6 to 11 are all related to complementary energy methods and dual variational principles applied to finite element approximations.

In Chapter 6, D. J. Allman discusses the use of compatible and equilibrium models and finite elements, applied to the stretchings of elastic plates. A new triangular equilibrium element is introduced and the properties of the associated matrix is studied in detail.