$$\therefore F_0 = F_1 - 10(10k_4F_1 + 10k_4F_0)/sT_D$$
$$+100(10k_3F_1 - 10k_3F_0)/s^2T_D^2$$
$$-1000(k_2F_1 + k_2F_0)/s^3T_D^3$$
$$+10{,}000(k_1F_1 - k_1F_0)/s^4T_D^4.$$

Multiply throughout by $T_D^4s^4/10{,}000k_1$,

$$\therefore s^4T_D^4F_0/10{,}000k_1 = s^4T_D^4F_1/10{,}000k_1$$
$$- s^3T_D^3k_4(F_1 + F_0)/100k_1$$
$$+ s^2T_D^2k_3(F_1 - F_0)/10k_1$$
$$- sT_Dk_2(F_1 + F_0)/10k_1 + (F_1 - F_0).$$

Let

$$a_1 = k_2T_D/10k_1,\ a_2 = k_3T_D^2/10k_1,\ a_3 = k_4T_D^3/100k_1$$
$$a_4 = T_D^4 10{,}000k_1.$$

Re-arranging, we have

$$\therefore \frac{F_0}{F_1} = \frac{1 - a_1s + a_2s^2 - a_3s^3 + a_4s^4}{1 + a_1s + a_2s^2 + a_3s^3 + a_4s^4}$$

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Book Review

Mathematical Methods for Digital Computers, Volume 2, edited by A. Ralston and H. S. Wilf, 1967; 287 pages. (New York, Chichester, Sydney: *John Wiley and Sons Inc. 112s.*)

Volume 1 of *Mathematical Methods for Digital Computers* appeared in 1960 and contained twenty-six chapters, each giving a computer-oriented description of various processes or applications of numerical analysis. Volume 2 presents entirely new material but has the same format as Volume 1. Thus the formulation and mathematical description of a problem is followed by a concise summary of the computational procedure, a detailed schematic flow chart and a box-by-box description of each step. A complete FORTRAN program is also listed where space permits, and a small sample problem is given to illustrate typical behaviour of the process under description. A count of the number of arithmetic operations involved provides an estimate of the running time.

The present volume contains thirteen chapters grouped into six parts. Parts I and II each contain a single chapter, the first giving an introduction to the FORTRAN and ALGOL programming languages and the second describing applications of the quotient-difference algorithm. Parts III, IV and V have the titles 'Numerical Linear Algebra', 'Numerical Quadrature and Related Topics', and 'Numerical Solution of Equations', respectively, and contain three chapters each. The solution of ill-conditioned linear equations, the Givens-Householder method for symmetric matrices and the LU and QR algorithms for non-symmetric matrices are discussed in Part III, whilst Part IV includes Romberg quadrature, approximate multiple integration and the use of spline functions for interpolation and quadrature. Part V deals with general iterative methods for solving transcendental equations, the use of the 'resultant' procedure for the numerical solution of polynomial equations, and the application of alternating-direction methods to the solution of heat-conduction problems—partial differential equations are not encountered elsewhere in the book, incidentally. Part VI contains two chapters on random number generation and rational Chebyshev approximation.

The reduction in the number of chapters, as compared to Volume 1, has allowed considerably more space to be devoted in this volume to mathematical discussion and development. This is a particularly valuable feature of the book—combined with the extensive list of references, the chapters provide an excellent introduction to the topics discussed, besides giving a detailed presentation of particular methods. A minor criticism of Chapter 8 is the suggested use of successive overrelaxation to solve a set of linear equations with a triple-diagonal matrix of coefficients: a direct elimination method is surely preferable, and is indeed given in Chapter 11. The reader is also advised that incorrect results are quoted for the sample problem in Chapter 6 to illustrate the use of Romberg quadrature. The given FORTRAN program has, however, been rerun and produces correct answers.

The Editors have obviously been at pains to secure contributions from active research workers in the particular fields covered, and the result is a book which can be recommended for its expertise to numerical analysts and programmers alike. Inevitably some topics, such as the numerical solution of integral equations and the use of Chebyshev series for the solution or ordinary differential equations, are not discussed in either volume. Perhaps some future Volume 3 will cater for growing interest in these subjects.

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