48 [9.20].—SOL WEINTRAUB, *Computer Program for Compact Prime List*, Microfiche supplement, this issue.

This FORTRAN program computes primes beginning at N and lists them in compact form as shown in [1].

The user enters the number N, where N ranges from zero to a limit set by the user's computer. For 32-bit machines the maximum N is $\sim 2^{30}$, or approximately 1.1 billion. N should be a multiple of 50000.

The program calculates primes for 20 intervals of 50000, i.e., an interval of 10^6, and lists the primes in compact form at the rate of an interval of 50000 per page.

The primes are generated by a modified sieve. The number N is divided by odd numbers j and the remainders r_j are noted. The *composite* numbers are then the numbers of the form $N - r_j + k_j$, where $k = 1, 2, 3, \ldots$. The entire run takes a few seconds of computer time.

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1. S. WEINTRAUB, "A compact prime listing," *Math. Comp.*, v. 28, 1974, pp. 855–857.

49 [4.00].—RALPH A. WILLOUGHBY, Editor, *Stiff Differential Systems*, Plenum Press, New York, 1974, x + 323 pp., 25 cm. Price $25.00.

This proceedings of an International Symposium on Stiff Differential Systems held in October, 1973, consists of nineteen papers on theoretical and practical aspects of stiff methods and their applications. In addition to a unified bibliography with dates from 1885 to 1973, there is an extremely valuable subject index which refers not only to the symposium papers but also to the bibliography.

Stability is the principal subject of four of the papers. Tests for A-stability and for stiff stability of composite multistep methods are given by Bickart and Rubin. Van Veldhuisen uses new concepts of consistency and stability to analyse global errors when the step size is large. Gear, Tu and Watanabe give sufficient conditions for changing both order and step size without affecting the stability of Adams methods. Also, Brayton shows that an A-stable multistep formula together with "passive" interpolation yields stable difference equations for certain difference-differential systems.

Five papers deal with new methods. Enright presents his stiffly stable second derivative methods and two modifications directed at large systems. Liniger and Gagnebin give an explicit construction for a $(2k - 2)$-parameter family of second order A-stable methods. The implicit midpoint method with smoothing and extrapolation is the basis for Lindberg's stiff system solver, and Dahlquist's paper provides the theoretical foundation for this approach. Two unconventional classes of methods are introduced by Lambert: a linear multistep method with variable matrix coefficients and an explicit nonlinear method based on local rational extrapolation.

Other program packages besides those of Enright and Lindberg are described. The special package by Edsberg for simulating chemical reaction kinetics automatically constructs an o.d.e. system from given reaction equations, generates subroutines for both the derivative and the Jacobian and uses Lindberg's solver. Gourlay and Watson indicate some of the practical difficulties they encountered while adding a version of Gear's stiff solver to the IBM "Continuous System Modeling Program", and Hull discusses validation and comparison of stiff program packages.

Stiff systems obtained by semidiscretization of parabolic partial differential equations are treated in two papers. Chang, Hindmarsh and Madsen study the simulation of chemical kinetics transport in the stratosphere, while Loeb and Schiesser study how the eigenvalues and stiffness ratio vary with the number of points in the spatial difference grid for a model problem.

Asymptotic approximation appears in several of the articles. Lapidus, Aiken and Liu survey the occurrence of stiff physical and chemical systems and show certain relationships among pseudo-steady-state approximation, singular perturbations, and stiff systems. Kreiss' paper deals with solutions for singular perturbations of two-point boundary value problems.

Stetter analyses and extends some novel ideas of Zadunaisky on global error estimation using nonstandard local error estimates. Hachtel and Mark combine polynomial prediction and truncation error control with a Davidenko-type parameter stepping method for nonlinear algebraic equations. Bulirsch and Branca briefly discuss computation in real-time-control situations.

As one can see from the topics mentioned here, this book is not for the novice. However, for the mature reader, it is an excellent guide to the literature on and introduction to the many difficult aspects of stiff equations.

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50 [9.00, 9.20].—SAMUEL YATES, *Prime Period Lengths,* 104 Brentwood Drive, Mt. Laurel, N.J., 1975, ii + 131 pp. Price \$10.00 (paperbound).

This is a privately printed and bound version of the author's UMT previously reviewed in [1], which one should see for additional description. The new version achieves a reduction in size by a factor of 8 by printing four reduced-size pages of the previous table on each side of a page. The main content, as before, is a list of the 105000 primes $p \leqslant 1370471$ (excluding $p = 2$ and 5) versus the period P of the decimal expansion of the reciprocal $1/p$. Of course, P is also the order of 10 $\pmod p$ and what the author calls "full-period primes" (those with $P = p - 1$) are the primes having 10 as a primitive root.

The preface indicates that the main purpose of this publication is to enable investigators to study questions of distribution and to formulate appropriate conjectures. That being the case, it is surprising that the author does not include derived tables of such distributions, e.g., a table of the distribution of the "full-period primes." The reviewer agrees that there are interesting distribution problems here. He must admit, though, that he has also used the table for a much simpler purpose, namely, as a convenient list of primes $\leqslant 1370471$.

The one-page introduction contains a passage of such ambiguity that it must be quoted in full:

"Asymptotically speaking,

a. The period lengths of all primes are distributed evenly among the sixteen possible residue classes (mod 40).

b. The period lengths of half of all the primes congruent to 13 or 37 (mod 40) are even, and half are odd.

c. The period lengths of five sixths of all primes congruent to 1 or 9 (mod 40) are even, and one sixth are odd.

d. The period lengths of two thirds of all primes are even, and one third are odd.

e. If we divide all primes into three categories—full-period, odd period length, and non-full-period with even period length—the ratio of totals to each other in the given order, is 9:8:7.