In this volume, special emphasis is placed on theoretical aspects of approximation theory and closely related topics of functional analysis. The volume also contains articles on other topics of functional analysis and on numerical analysis. The classical topics of approximation theory are well represented, while the active field of approximation by splines and other piecewise polynomial functions is discussed in only two of the papers. The influence of Jean Farvard is strongly felt in several contributions on saturation theory.

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5 [2.10, 7.00].—ROBERT PIESSENS, *Gaussian Quadrature Formulas for the Numerical Integration of Bromwich's Integral and the Inversion of the Laplace Transform*, Report TW1, Applied Mathematics Section, University of Leuven, June 1969, 10pp. + tables (48 unnumbered pp.), 27 cm. Copy deposited in UMT file.

If $F(p)$ is the Laplace transform of $f(t)$ and s is a positive parameter such that $p^s F(p)$ is analytic and has no branch point at infinity, then the tables in this report consist of 16S floating-point values of the coefficients A_k and p_k in the formula

$$f(t) = t^{s-1} \sum_{k=1}^{N} A_k (p_k/t)^s F(p_k/t),$$

such that it is exact when $F(p)$ is a linear combination of $p^{-(s+k)}$ for $k = 0(1)2N - 1$. As the author notes, such a parameter s may not exist for some Laplace transforms; nevertheless, even in such cases it is claimed that the formula gives good numerical results.

The coefficients p_k and A_k are complex numbers, occurring in conjugate complex pairs; accordingly, it suffices to tabulate only the p_k with positive imaginary part, together with the corresponding A_k, and this is done here for the ranges $N = 6(1)12$ and $s = 0.1(0.1)3(0.5)4$,

$$\frac{1}{3}, \frac{2}{3}, \frac{4}{3}, \frac{5}{3}, \frac{7}{3}, \frac{8}{3}, \frac{10}{3}, \frac{1}{4}, \frac{3}{4}, \frac{5}{4}, \frac{7}{4}, \frac{9}{4}, \frac{1}{6}, \frac{1}{7}, \frac{1}{8}, \frac{1}{9}.$$

The numbers p_k were calculated as the zeros of generalized Bessel polynomials $P_{N,s}(p^{-1})$ by Newton-Raphson iteration, and the coefficients A_k were then calculated from the relation

$$A_k = (-1)^{N-1} \frac{(N-1)!}{\Gamma(N+s-1)Np_k^2} \left[\frac{2N+s-2}{P_{N-1,s}(p_k^{-1})} \right]^2 .$$

All calculations were performed on the IBM 1620 system at the Computing Centre of the University of Leuven.

Application of the tables is illustrated by four diversified examples.

In his description of previous tabulations of this type the author includes references to tables by Salzer [1], [2] and by Stroud & Secrest [3], wherein s is restricted to the special value 1, and to more general tables by Skoblia [4] and by Krylov & Skoblia [5].

J. W. W.

1. H. E. SALZER, "Orthogonal polynomials arising in the numerical evaluation of inverse Laplace transforms," *MTAC*, v. 9, 1955, pp. 164–177.

2. H. E. SALZER, "Additional formulas and tables for orthogonal polynomials originating from inversion integrals," *J. Math. and Phys.*, v. 40, 1961, pp. 72–86.

3. A. STROUD & D. SECREST, *Gaussian Quadrature Formulas*, Prentice-Hall, Englewood Cliffs, N. J., 1966.

4. N. S. SKOBLIA, *Tables for the Numerical Inversion of Laplace Transforms*, Academy of Sciences of USSR, Moscow, 1964. (Russian) (For a review, see *Math. Comp.*, v. 19, 1965, pp. 156–157, RMT 15.)

5. V. I. KRYLOV & N. S. SKOBLIA, *Handbook on the Numerical Inversion of the Laplace Transform*, Izdat. Nauka i Teknika, Minsk, 1968.

6 [2.20, 2.35].—A. S. HOUSEHOLDER, *KWIC Index for the Numerical Treatment of Nonlinear Equations*, Oak Ridge National Laboratory, Oak Ridge, Tennessee, 1970, vii + 129 pp., 28 cm. Available from U. S. Department of Commerce, Springfield, Va. 22151. Price: printed copy $3.00; microfiche $0.65.

The author of this index has a reputation not only for his numerous original research contributions but also for his many excellent bibliographies. For example, his extensive bibliography on numerical analysis in his book, *Principles of Numerical Analysis* [McGraw-Hill, 1953; continued in *J. Assoc. Comput. Mach.*, v. 3, 1956, pp. 85–100] has been one of the earliest reference collections in that field and as such has had considerable influence. More recently appeared a *KWIC Index for Matrices in Numerical Analysis* (Oak Ridge National Lab. Report ORNL-4418] and the present index on nonlinear equations is described as being in part a supplement to it. In the words of the preface, this is to mean that "many items, especially textbooks and treatises, relate to both topics, but (that), apart from accidental duplication, each item is listed in only one place".

The present index contains 1182 items and thus is probably the most extensive reference collection on nonlinear equations. At the same time, no claim for completeness can be or is being made. The preface specifically observes that "for the older literature, no exhaustive historical search was attempted" and that on the topic of solving systems of equations "the list is far from exhaustive", since "this area merges imperceptibly into the far more general one of solving functional equations, on the one hand, and on the other of mathematical programming, where the literature is vast". This latter point probably accounts for the fact that, for instance, a bibliography of Ortega and Rheinboldt [*Iterative Solution of Nonlinear Equations in Several Variables*, Academic Press, 1970] contains a number of titles which would appear to have been natural candidates for inclusion in this index. Also, the earlier