

polynomials, following which he discusses the Hermite-Fejér polynomials, a theorem of J. L. Walsh on simultaneous approximation and interpolation by polynomials, and the Stone-Weierstrass theorem.

Chapter VII ("Best Approximation") deals with the existence, uniqueness, and other properties of best approximations. Its central topic is the Tschebyscheff best approximation (in the real and in the complex domains).

The next chapter, entitled "Least Square Approximation," is concerned with this classical subject, developed via the theory of inner product spaces.

Chapter IX is an introduction to the theory of Hilbert space, while Chapter X is concerned with the subject of orthogonal polynomials. Such polynomials are considered again in an appendix, entitled "Short Guide to the Orthogonal Polynomials," appearing at the end of the book.

The eleventh chapter is entitled "The Theory of Closure and Completeness"; it deals with pertinent topics from both classical and functional analysis. Included are classical results of Runge and Walsh on approximation in the complex domain and the Müntz closure theorems.

In the next chapter ("Expansion Theorems for Orthogonal Functions") we find a study of Fourier series, convergence of the Legendre series for analytic functions, complex orthogonal expansions, and reproducing kernel functions.

Chapter XIII ("Degree of Approximation") deals with measures of best approximation for different norms. Various estimates of such measures are given.

The concluding chapter, entitled "Approximation of Linear Functionals," contains such topics as the Gauss-Jacobi theory of approximate integration, weak* convergence and its applications, and equidistributed sequences of points.

A bibliography, listing 141 books and papers, is appended.

One of the attractive features of the book is the inclusion of a large number of illustrative examples and problems.

One is impressed by the success of the author in attractively presenting many chapters of classical and functional analysis via approximation theory. The author imparts to the reader his own enthusiasm and appreciation for the beauty of mathematical analysis as well as for its practical applications.

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19[K].—V. D. BARNETT, *Random Negative Exponential Deviates*, Cambridge University Press, New York, 1965, xxii + 89 pp., 23 cm. Price 10s 6d (paper-bound).

This tract presents three tables. The first is a table of 10,000 four-place pseudo-random numbers x belonging to the probability density $\exp(-x)$. These numbers were generated in the form $x = -\ln y$, where the numbers y were generated by the congruential method for simulating uniformly distributed random variates on the interval $0 < y < 1$. The second table consists of the 10,000 numbers $x' = -\ln(1 - y)$. These numbers are negatively correlated with the corresponding numbers x . In Monte Carlo applications, corresponding pairs x, x' are used in the method of antithetic variates. The last table consists of 1,000 samples of a pseudo-

random variate z belonging to the chi-square distribution with one degree of freedom. These numbers were formed as $z = g^2$, where g is a Gaussian variate formed by the Box-Muller method from a uniform variate. The numbers x and z can be used to simulate a variate chi-square with any positive-integer degree of freedom. The tables are subjected to various tests of randomness, and an example is given of their use in a Monte Carlo application.

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20[K, P].—HERBERT FREEMAN, *Discrete-Time Systems: An Introduction to the Theory*, John Wiley & Sons, Inc., New York, 1965, xiii + 241 pp., 24 cm. Price \$10.00.

This handsomely-made book attempts to fill an important role in the analysis of discrete-time systems, particularly of systems that contain digital computers. The book is well written, in the sense that the prose is lucid, but it suffers from a lack of organization and unity that reduce it from a self-contained text to a useful reference for a number of somewhat disjointed topics.

The major fault of the book is the absence of an attempt to inform the reader of the reasons for the choice and order of topics. As a result, the underlying unity of the subject matter is never brought out. The material is not elegant enough to form a satisfying mathematical treatise, so the choice of topics has to be based on utility in engineering applications. Unfortunately, the use of this material is brought in only on an ad hoc basis, rather than as an integral part of the fabric of the text.

The preface of the book is excellent, eloquently discussing the requirement for a good treatment of the subject. The introductory chapter is quite good in introducing the basic concepts of the field and in relating the models studied to the actual phenomena that they try to describe. Some of the definitions themselves depend on undefined terms, but this is a minor failing, since the meaning is usually clear, and since the following treatment is descriptive rather than deductive. The chapters that present analytical tools (Chapters 2–5) contain much material that will be useful to the working engineer who knows what his problem is and needs a method of solution. For the reasons given above, these chapters do not of themselves form the basis for a satisfying text. Chapters 6 and 7, on continuous-time systems with discrete-time inputs, and on sampled-data control systems, respectively, are interesting surveys of applications of the preceding theory, but they suffer somewhat from the attempt to handle difficult problems (especially stability theory) on an elementary level.

The final chapter, on discrete stochastic processes, is especially unsatisfactory, since the mathematical level sufficient for most of the rest of the book is wholly insufficient even to transmit an appreciation of the nature of the stochastic problems, let alone of their solutions. (In fact, the book suffers throughout from the absence of an early treatment of noise in this type of system.)

In sum, for the reader who has entered this field without the proper mathematical background, but who understands what problems exist, this will be a readable and useful reference. The individual paragraphs are well-written and reasonably