They are of high quality. The organizers of the conference are to be congratulated on the papers solicited. The University of Wisconsin Press has produced a handsome volume by a photographic process which makes a very readable page. The relatively low cost of the volume is especially noteworthy.

A. H. T.

96[X].—W. L. Wilson, Jr., "Operators for solution of discrete Dirichlet and Plateau problems over a regular triangular grid," May 1959, 29 cm., 191 p. Deposited in UMT File.

These tables list to 10D coefficients of a matrix operator for conversion of boundary values over an equilateral triangle to a discrete harmonic function over a regular triangular grid of 190 points in this triangle [1]. Sixty-three boundary values are involved, of which the three at the vertices do not influence the interior values of the function. The tables are useful in the approximate numerical solution of the Laplace equation over this triangular region.

Solutions for smaller triangles have been placed in the UMT File by the same author [2].

Also included are tables giving 10D coefficients of the analog of the Douglas functional over this same grid. Specifically, these are coefficients of a quadratic form (using scalar multiplication) of vector functions from the grid points of the bounding equilateral triangle to some euclidean space such that the value of the form is the Dirichlet integral

$$D = \frac{1}{2} \int (E + G)\, d\sigma$$

where E and G are coefficients of the first fundamental form of the surface got by linear interpolation of the discrete harmonic vectors resulting from application of the operator described above to the boundary values. This is a discrete analog of the functional used by J. Douglas [3] in his solution of the Problem of Plateau; it has application in the approximate numerical solution of that problem.

C. B. Tompkins

University of California
Los Angeles, California

1. L. V. Kantorovich & K. I. Krylov (translated by Curtis D. Benster) *Approximate Methods of Higher Analysis*, Nordhoff, Gronigen, Interscience, New York, 1958, p. 187–188.
2. W. L. Wilson, Jr., "Tables of inverses to Laplacian operators over triangular grids," UMT File, MTAC, No. 58, v. XI, 1957, p. 108.
3. J. Douglas, "Solution of the problem of Plateau," Amer. Math. Soc. *Trans.*, v. 33, 1931, p. 263–321.

97[Z].—Jack Bonnell Dennis, *Mathematical Programming and Electrical Networks*, John Wiley & Sons, Inc., New York, 1959, vi + 186 p., 24 cm. Price $4.50.

As the title indicates, the purpose of this little monograph is to explore the relationships of general programming problems and corresponding electrical networks, with a view towards gaining physical insight and developing computational algorithms. The contents of the book essentially comprise the author's doctoral dissertation in the department of Electrical Engineering at M.I.T. The pages are offset reproductions of typescript. In a foreword by J. A. Stratton, it is stated that "there has long been a need for publication of research studies larger than a journal article but less ambitious than a finished book," and with this apology the present volume is put forth.

After an introductory Chapter 1, the general programming problem is presented in Chapter 2, along with discussions of convexity and concavity, the generalized method of Lagrangian multipliers due to Kuhn and Tucker, and duality. Chapter 3 consists of basic material on electrical networks containing resistors, diodes, ideal transformers, voltage sources, and current sources. The electrical network problem, which is a set of linear equations with side conditions in the form of inequalities due to the presence of diodes, is stated and shown to be equivalent to a quadratic programming problem (and its dual), viz., to find a feasible current distribution which minimizes the power absorbed by the voltage sources plus one-half the power absorbed by the resistors, with a corresponding statement for the dual. The concept of the two-terminal, or terminal-pair, network is introduced in this chapter, with a discussion of the set of solutions (ϵ, δ), where ϵ is the voltage between the terminals when current δ enters one terminal and leaves the other. The set of all (ϵ, δ) forms a "break-point curve" in the $\epsilon\delta$ plane, i.e., a non-decreasing polygonal graph.

Chapter 4 is devoted to the problem of flow in a network, which includes allocation, distribution, and assignment problems. It is shown that every flow problem can be realized by an electrical network containing only diodes, voltage sources, and current sources. Existence conditions from the theory of programming and non-redundancy assumptions are stated here in electrical network terms. Two algorithms are presented for the solution of diode-source networks, one corresponding to the primal and the other to the dual problem. They are similar to but more general than the procedure of Ford and Fulkerson for the transportation problem.

Chapters 5 and 6 treat the general linear and quadratic programming problems. A procedure is described for "tracing" the break-point curve corresponding to a pair of terminals, which is very similar to what goes on in the simplex method of Dantzig. This procedure is used with electrical models of the general quadratic (including linear) problems, and two types of algorithms for their solution are described. Chapter 7 contains a brief and incomplete discussion of the general programming problem. An algorithm is proposed which is based on the method of steepest descents. The main body of text is followed by eight appendices in which proofs are given of the main theorems of programming.

There are several typographical errors of a minor nature. The number of statements that are only partially true seems to be about par for a book on a mathematical subject written by an engineer.

J. Bram

Bureau of Ships
Navy Department
Washington 25, District of Columbia