$2[T_2(a) - T_1(a)]$, and the characteristic exponent h are given for each λ. If we set

$$h(t) = \lambda \int_0^t (1 - \chi^2)\, dt, \qquad \text{then} \quad h = h(\omega)/\omega.$$

For each λ there is a plot of the hodograph $\left(\chi, \frac{d\chi}{dt}\right)$ and the curve $\chi(t)$ (including $\lambda = 0, 1$). An additional graph depicts a, ω, and h as functions of λ in the interval [0, 10].

E. I.

94[M, P, S].—R. L. MURRAY & L. A. MINK, *Tables of Series Coefficients for Burnup Functions*, Bulletin No. 71, Department of Engineering Research, N. C. State College, Raleigh, N. C., May 1959, 82 p., 28 cm. Price \$1.50.

In a certain model, calculation of nuclear reactor properties under long-term operation requires the evaluation of

$$A_0 = \overline{\varphi^{(l)}} \left[\frac{1}{\delta_z\, \pi/2} \int_0^{\delta_z \pi/2} (\cos x)^l\, dx\right]\left[\frac{2}{(\delta_r\, j_0)^2} \int_0^{\delta_r j_0} x[J_0(x)]^l\, dx\right],$$

$$a_0 = \frac{\overline{\varphi^{(l+1)}}}{\overline{\varphi^{(l)}}}, \quad A_1 = \frac{1}{2}\left[\frac{\overline{\varphi^{(l+2)}}}{\overline{\varphi^{(l)}}} - a_0^2\right]$$

and some other combinations of $\overline{\varphi^{(l)}}$. Here j_0 is the smallest positive zero of $J_0(x)$. All functions are tabulated for the range $l = 0(1)4$, δ_i, $\delta z = 0.50(0.05)0.60(0.02)1.0$. A_0 and a_0 are given to 7D; A_1 to 6D, and the remaining functions not listed here are given with less accuracy. Similar tables are given for the function

$$A_0 = \frac{3}{(\delta\pi)^3} \int_0^{\delta\pi} x^2 \left(\frac{\sin x}{x}\right)^l dx.$$

The method of computation is not explained, nor is j_0 defined. We infer the definition of j_0 from physical considerations corroborated by numerical evaluation. Spot checks indicate the entries are accurate to the number of places given.

Y. L.

95[W, X].—RUSSELL L. ACKOFF, Editor, *Progress in Operations Research*, Vol. 1, John Wiley & Sons, Inc., New York, 1961, 505 p., 23 cm. Price \$11.50.

Each chapter of this book is written by different authors. It treats recent progress in some of the methodological fields of operations research, such as linear programming, in an outstanding manner, scantily discussing progress in others, such as queuing theory.

The introductory chapter, written by the editor of the book, is excellent. He points out that in other well-established scientific fields one is not as concerned about definitions as those in operations research have been, that this field is now accepted and has acquired the confidence of workers in other fields, and that, as a result, there is less craving for definitions.

An interesting chapter by Churchman on contributions to decision and value theory then follows. Hanssmann's chapter on inventory theory leaves much to be desired and is not saved even by attempting to justify the presentation in an operations research framework. The use of parallel and series stations leaves many problems untouched. The stochastic nature of the field does not come through satisfactorily. A chapter on mathematical programming follows, in which Arnoff and Sengupta give a superb account of progress in programming except for non-linear programming, in which there have been several recent contributions, such as that of Zoutendijk [1]. A remark at the top of page 176 regarding the unavailability of work on sensitivity is inaccurate. This reviewer has proved in the 1959 paper referred to on page 209 that at a solution vertex the objective function (in the customary notation) has the following sensitivity to a_{ij}

$$\frac{\partial V}{\partial a_{ij}} = - x_j^0 y_i^0 = \frac{\partial V}{\partial b_i} \frac{\partial V}{\partial c_j}$$

where x_j^0 and y_i^0 are the solutions to the primal and the dual, respectively. A readable and very useful account of dynamic programming, including adaptive processes, is then given by Dreyfus. Chapter 6 by Morse deals with Markov and queuing processes. Sisson studies sequencing theory in chapter 7, and a variety of very useful replacement models, developed by a number of individuals, are treated by Dean in the next chapter. In another chapter, Morgenthaler describes simulation and Monte Carlo in a manner which provides useful guide-lines for application. Thomas, well known for his contributions to game theory, treats the subject in chapter 10 in an interesting style which utilizes historical ideas on the subject. The presence of these two chapters clarifies in the mind of the reader differences between simulation and gaming. Magee and Ernst examine the future of operations research in chapter 11 and point out the need of quantitative models of human behavior, marketing, interaction of men with men and with machines, organization, and information; and they call for a better grasp of risk and competition. They point out that operations research is far from mature and has promise. This book is recommended reading.

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1. G. ZOUTENDIJK, "Maximizing a function in a convex region," *J. Roy. Statist. Soc.*, v. 21B, 1959, p. 338–355.

96[X].—THOMAS L. SAATY, *Mathematical Methods of Operations Research*, McGraw-Hill Book Co., Inc., New York, 1959, xi + 421 p., 24 cm. Price $10.00.

This book is about some selected mathematical methods of operations research, but it offers both more and less than what its title may suggest to some readers. Though full of mathematical results, this book is not a cycle of "lemma, theorem, proof, and corollary." Though it has many problems, and though Saaty is deeply concerned with principles of solution, this book is not a "problem manual." Despite the fact that there are many illustrative applications, this is far from being either a "cook book" or a collection of case studies.

For the unifying thread of the book, one must look to the exuberant creativity of Saaty himself. He sets the tone of the book in the preface with the statement