

THOMAS L. SAATY, *Elements of Queueing Theory, with Applications*. McGraw-Hill Book Company, New York, New York, 1961. \$11.50 xv + 423 pp.

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Since around 1955, the literature of mathematical congestion theory has been emerging from the journal articles and appearing in books. One of the first of these books written in English is Dr. Saaty's, and it is an ambitious effort in that he tries to accomplish three tasks: (1) to give the reader most of the mathematical methods that are used in queueing theory, (2) to canvass the enormous literature of the subject, indicating who has written about what problem, and (3) to present systematic accounts of the mathematical models used in congestion theory. His book is divided into four parts. Part 1 introduces the topics of queueing theory, describes illustrative mathematical models of queueing situations, and gives a review of probability and Markov stochastic processes. Part 2 is brief, and deals with those queueing models which can be treated by use of birth-and-death processes. Part 3, entitled "Non-Poisson Queues" is about models in which either the interarrival times or the service times do not have a negative exponential distribution. The material covered is the by now well-known work of Pollaczek, Khinchin, and Takács. Throughout, the methods employed reduce to the solution of Kolmogorov's equations for a Markov process. Part 4, finally, concerns ramifications and applications of the preceding theory, together with an account of renewal theory. Each Part described above consists of several chapters (minimum two, maximum five), and each chapter ends in copious exercises and further results that the reader is invited to solve and verify, respectively.

Upon glancing at the book, it is apparent that the author has tried to give a wide survey of the literature and methods of queueing theory, one that will be accessible (that is, intelligible, and hence useful) to a large number of potential users: engineers, mathematicians, operations analysts, etc. For this reason he has held the mathematical level of his book down to a denominator consisting of elementary probability, calculus, Laplace-Stieltjes transforms, and in a few places, elementary complex variables. In making such a restriction he is justified also by the historical development of the field, for these topics form a kernel on the basis of which most of the literature of congestion can be understood.

How then does the theory of queues fare with the author when he has set his sights in this way? As a review of the subject, Dr. Saaty's text is superb in several respects, and lacking in others. In comprehensiveness he has outstripped all authors except possibly R. Syski, whose 700-page volume was nevertheless devoted largely to telephony problems. His is the second English text on the subject that is not explicitly a monograph of frankly limited scope. He gives an abundance of concrete formulas and actual results which the practitioner can use or adapt, and he surveys the principal methods of solving problems.