BOOK REVIEWS

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Matrix-geometric solutions in stochastic models, an algorithmic approach, by Marcel F. Neuts, The Johns Hopkins University Press, Baltimore, 1981, xiii + 332 pp., $32.50.

This book is concerned with steady-state solutions to queueing systems. In general, such systems involve customers (not necessarily people) arriving at some service facility, waiting for service if it is not immediately available, and leaving the system after having been served. They are characterized by the arrival pattern of customers (given in terms of the distribution of the number of arrivals or of interarrival times), the service pattern of servers (given by service distributions), the queue discipline (e.g., first come, first served; last in, first out; selection for service in random order independent of the time of arrival to the queue; and so on), the system capacity (size of the waiting room), the number of service channels, and the number of service stages (one or multiple stages, with or without recycling of the departing customers).

Queueing systems can be deterministic, probabilistic or both. An example of one which is both is a queue in which the customers arrive by appointment or at fixed intervals (a deterministic input) but their service times may differ (probabilistic service). Most of the work done in this field is usually of a probabilistic nature, i.e., the interarrival and service time variables are assumed to be random variables. Their efficiency can be measured in terms of the length of time a customer might be forced to wait (the waiting time), the number of customers which may accumulate (length of the queue), and the busy (or idle) period of the servers.

The classical approach to the analysis of queues is to assume that the variables representing the interarrival and service times follow some specific distributions, and define the state of the system by the number of customers in the system (in queue and in service) at a given time. The object is to find the probability distribution of the number of customers in the system from which the desired measures of efficiency can be derived. One way of doing this is to formulate a system of differential-difference equations to represent the behavior of the queue in time. The unknowns are the probabilities that the system is in a certain state at a given time. The solution to this system of equations is known as "the transient solution". Of particular interest is the solution to the system of equations when time tends to infinity—the steady-state solution. This is the main subject of the book by Marcel F. Neuts.