

Abstract

“Queueing Theory” is a very effective tool in the design and performance analysis of computer and communication systems. In telecommunication systems based on Asynchronous Transfer Mode or Broadband Integrated Services Digital Network the traffic sources for packetized data flows reveal bursty and correlated statistical behaviour affecting system performance in a crucial way. Markovian arrival process is a very good representation of such type of traffic. On the other hand vacation queues have been widely used in modern telecommunication and manufacturing systems. The objective of this thesis is to analyze some finite-/infinite-buffer vacation or non-vacation queueing models with arrival process as Markovian arrival process or service process as Markovian service process and suggest computational procedures for computing various state probabilities.

This thesis is formed of nine chapters. Chapter 1 is introductory, justifies the purpose and reasons for our work. Chapters 2 to 5 are devoted to the steady-state analysis of finite-buffer queueing models with vacation(s) under limited service disciplines and Markovian arrival process/batch Markovian arrival process. In Chapter 6, we analyze the finite-buffer working vacation models with renewal input. Chapter 7 contains the study of finite- and infinite-buffer queueing models with Markovian service process. The study of finite-buffer queueing models with batch arrival/batch service under Markovian service process have been dealt in Chapters 8-9. These models have wide applications in many areas such as telecommunication systems, computer networks and manufacturing systems.

Keywords: Batch Markovian arrival process; Blocking probability; Bulk arrival; Computational; E-limited service; Embedded Markov chain; Finite-buffer; General bulk service rule; Infinite-buffer; Limited service discipline; Matrix-geometric method; Markovian arrival process; Markovian service process; Multiple vacations; Queue; Renewal theory; Relation; Single server; Single vacation; Steady-state; Supplementary variable; Working vacation