

A computational approach for determination of system length distribution of a batch arrival and batch service queue

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Abstract

We consider an infinite-buffer threshold-based batch-service queue with general service time distribution. Customers arrive in batches according to compound Poisson process. A bivariate probability generating function for queue content and server content at departure epoch is derived using the supplementary variable technique. It is evident from the available queueing literature that, the extraction of the joint distribution through the inversion of the bivariate generating function requires a lot of computational involvement and sometimes becomes quite difficult. We extract the joint distribution of the queue and the server content from this complex bivariate generating function that appeared in the present analysis. Our proposed procedure is quite simple, mathematically tractable and easily implementable. Furthermore, to obtain the joint distributions at arbitrary and pre-arrival epochs, we establish two relationships between departure and arbitrary, and arbitrary and pre-arrival epoch probabilities. Our approach is validated by means of some illustrated numerical examples.