Performance Analysis of the N-Policy $M/H_k/1$ Queue with Balking and Multiple Vacations

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Abstract

This paper presents an analysis for an N-policy $M/H_k/1$ queuing system with balking and multiple vacations. The server takes multiple vacations when the system becomes empty. When a vacation is over, if N or more are present in system, the server must begin to serve the customers at once. Otherwise, the server can have another vacation. If customers on arrival find other customers in the system, they either decide to enter the queue or balk with a constant probability. By using the matrix geometric solution method, the matrix-geometric form solution for steady-state probability vectors is obtained and the computation of the boundary steady-state probability vectors is also discussed. Then, some performance measures of the system are derived explicitly. Based on these performance analysis, we develop a cost model to determine numerically the system's optimal cost and optimal critical value, and perform a sensitivity analysis through numerical experiments. Finally, we introduce the case of the non-constant balking probability.

Keywords: Queuing system, N-policy, balking, multiple vacations, matrix geometric solution.