He, Yaxing; Tang, Yinghui
M/G/1 queueing system with N-policy and delayed single vacation without interruption.
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Summary: This paper considers the M/G/1 queueing system with N-policy and delayed single vacation without interruption. By the renewal process theory, the total probability decomposition technique and the Laplace transform tool, we study the transient and equilibrium properties of the queue length from any initial states. Both the recursion expressions of the Laplace transformation of the transient queue-length distribution and the recursion expressions of the steady queue-length distribution are obtained. Meanwhile, we present the probability generating function of the steady queue-length distribution and the explicit expression of the additional queue-length distribution. Furthermore, some special cases, such as Y = 0, or Y → ∞, or vacation time V = 0, are also discussed. Finally, by the renewal reward theorem the explicit expression of the long-run expected cost per unit is derived under a given cost structure. Through numerical calculation, the optimal control policy N∗ which minimizes the long-run expected cost per unit time is determined.

MSC:

60K25 Queueing theory (aspects of probability theory)
90B22 Queues and service in operations research

Keywords:
N-policy; delayed vacation; vacation without interruption; queue-length distribution; optimal control policy