Steady state analysis of a non–Markovian bulk queueing system with 2b–policy and multiple vacation with exceptional last vacation.∗

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Abstract

This paper deals with the analysis of Mx/G(a, b)/1 queueing system with 2b–policy and multiple vacations with exceptional last vacation. After completing a service, if the queue length ξ is less than a, then the server leaves for multiple vacation till the queue length reaches b. After a vacation, if the queue length ξ is at least b, then the server avails an exceptional last vacation R. After this last vacation R, if the queue length ξ is greater than or equal to 2b, then the server starts the service with a batch of b customers, where b ≥ a. Otherwise, the server remains in the system till the queue length reaches 2b (by this assumption, the server has to complete at least two batches of service before availing a vacation). The period in which the server is available in the system without serving the customer is called as the dormant period. The subsequent services are done with b customers. After a service, if the queue length ξ is such that a ≤ ξ ≤ b, then the server serves a batch of min(ξ, b) customers, where b ≥ a. Using supplementary variable technique, the probability generating function of the steady state queue size at an arbitrary epoch is obtained.

∗Received: February 26, 2007; Accepted: January 11, 2008.

Key words and phrases: bulk queue, multiple vacations 2b–policy, probability generating function, expected queue length, idle time, busy period, waiting time, cost model.

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Expressions for expected queue length, expected length of busy and idle periods are derived. Expected waiting time in the queue is also obtained. A cost model of the queueing system is developed. Numerical illustration is presented.