A General Input Queue with N Policy and Service Rate Depending on Bulk Size

Jau-Chuan Ke\textsuperscript{1,*} and Kuo-Hsiung Wang\textsuperscript{2}

\textsuperscript{1}National Taichung Institute of Technology, Department of Statistics No. 129, Sec. 3, Sanmin Rd., Taichung 404, Taiwan, Republic of China

\textsuperscript{2}Department of Applied Mathematics, National Chung-Hsing University, Taichung 402, Taiwan, Republic of China

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Abstract—An embedded Markov chain is used to analyze a G/M/1 queuing system with N policy. When the system is empty, the server remains idle (deactivates) and does not start serving the waiting customers in the queue until the number of arrivals reaches N. The service is performed in batches of \( \min(n, N) \) if there are \( n \) customers waiting at the completion of service. Service times of the server depend on the batch sizes. We utilize the matrix-geometric method in the solution procedure and solve the stationary probabilities of the number of customers in the system by means of simultaneous linear equations. We further obtain a number of explicit and computationally tractable results such as mean queue length and mean waiting time in the queue. A numerical example illustrates the validation of the solution procedure.

Keywords—Bulk service, Bontrol policy, Queue, Waiting time distribution

\*Corresponding author’s email: jauchuan@ntit.edu.tw
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