

## **Analysis of Two Queueing Models with Explicit Rate Operators and Stationary Distributions**

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### **Abstract**

For QBD(quasi-birth-and-death) processes with countably many phases, it is well known that stationary distributions have operator-geometric forms. However, it is a challenging problem to determine the closed-form of both the rate operator (an infinite matrix) and stationary distribution for a given QBD process. In this paper, we will derive explicit rate operators and the stationary distributions for two special models: the T-SPH/M/1 queue and the M/T-SPH/1 queue, where T-SPH denotes the phase type distribution defined on the birth-and death process with countably many states.

*Keywords:* QBD process with countable phases, rate operator, stationary distribution, the T-SPH/M/1 queue, the M/T-SPH/1 queue.