

Kocheganov V.M. (Nizhny Novgorod, Russia) — Tandem of queueing systems with cyclic service with prolongations analysis

Consider a tandem of queueing systems. Each system has a high-priority input flow and a low-priority input flow which are conflicting. In the first system, the customers are serviced in the class of cyclic algorithms. The serviced high-priority customers are transferred from the first system to the second one with random delays and become the high-priority input flow of the second system. In the second system, customers are serviced in the class of cyclic algorithms with prolongations. Low-priority customers are serviced when their number exceeds a threshold. Problem statement and mathematical model construction can be found in [1]. The central object of the mathematical model is multidimensional denumerable Markov chain $\{(\Gamma_i, \varkappa_{1,i}, \varkappa_{2,i}, \varkappa_{3,i}, \varkappa_{4,i}); i \geq 0\}$. Here we assume that $\{\tau_i; i = 0, 1, \dots\}$ is a discrete time scale, when system is actually observed. Also let Γ_i be the server state during the interval $(\tau_{i-1}; \tau_i]$, $\varkappa_{j,i} \in \mathbb{Z}_+$ be the number of customers in the queue of j -th input flow at the instant τ_i , $\eta_{j,i} \in \mathbb{Z}_+$ be the number of customers arrived into the queue of j -th input flow during the interval $(\tau_i; \tau_{i+1}]$, $\bar{\xi}_{j,i} \in \mathbb{Z}_+$ be the actual number of serviced customers from the queue of j -th input flow during the interval $(\tau_i; \tau_{i+1}]$, $j \in \{1, 2, 3, 4\}$. Sufficient conditions of the stationary regime existence for Markov chains $\{(\Gamma_i, \varkappa_{3,i}); i \geq 0\}$ and $\{(\Gamma_i, \varkappa_{1,i}, \varkappa_{3,i}); i \geq 0\}$ were obtained in [1]. Also simulation model was built and experiments were made in [2] to analyze tandem in more details.

REFERENCES

1. *Kocheganov V.M., Zorine A.V.* Stationary regime of primary queues existence necessary condition in a tandem of queueing systems. Bulletin of the TvGU, Applied mathematics series, 2018, vol. 2, pp. 49–74.
2. *Kocheganov V.M., Zorine A.V.* Statistical analysis and optimization of tandem of queueing systems in a class of cyclic algorithms with prolongation. UBS, 2019, vol. 78, pp. 122–148.