SOJOURN TIME DISTRIBUTION IN POLLING SYSTEMS WITH PROCESSOR-SHARING DISCIPLINE

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We consider a polling system with a single server and multiple queues, where each queue has an infinite capacity. Customers arrive at the queues according to independent Poisson processes. The server visits and serves the queues in a cyclic order. When the server visits a queue, the server continues to serve the queue until the queue becomes empty. One queue uses processor-sharing as a scheduling policy, and the customers in that queue have the phase-type distributed service requirements. The other queues use any work-conserving policy, and the customers in those queues have generally distributed service requirements.

We are concerned with the analysis of the sojourn time distribution of an arbitrary customer who arrives at the queue with processor-sharing policy. We derive functional and partial differential equations for the transform of the conditional sojourn time distribution of an arbitrary customer, conditioned on the service requirement. We also provide equations for the transform of the unconditional sojourn time distribution. From this we obtain the first and second moments of the sojourn time distribution.