SIMULTANEOUS ARRIVAL OF CUSTOMERS TO TWO DIFFERENT QUEUES AND MODELING DEPENDENCE VIA COPULA APPROACH

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So far, queueing systems have been studied in a way that a customer is allowed to take turn only in one queue to receive a service. In application, when there exists a number of queues rendering the same service, some customers may tend to simultaneously take turn in more than one queue with an aim to receive the service sooner and thus reduce their waiting time.

In this paper, we introduce such a model and put forward a methodology to deal with the situation. In this regard, we consider two queues and assume that if a customer, who has turn in both queues, receives the service from one of the queues, the other turn is automatically withdrawn. This circumstance for the model brings about some abandonment in each queue as some customers receive the service from the other one.

In this article, we study the customer’s waiting time in the mentioned model, which is defined as the minimum of waiting times in both queues and obtain probability density function of this random variable. With that in mind, our approach to obtain probability density function of each of the waiting time random variables is to rely on the existing results for the abandonment case. We examine the situation in the cases of independence and dependence of the waiting time random variables. The latter is treated via Copula approach.

Keywords: Queueing Systems, Simultaneous Arrival of Customers, Waiting Time, Abandonment, Reneging, Copula.