On a Batch Arrival M(X)/M(a,b) (RB/ G(D)/G®/1 Queue with Exponential Service in Batches of Variable Size [a, b]', Time-Homogeneous Random Breakdowns, General Delay Times and General Repair Times

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Abstract

We study a batch arrival queueing system $M^X / M^{a,b} / 1$, where the server (service channel) provides exponential (one by one) service to customers in batches of variable size with minimum batch size '$a'$ and maximum batch size '$b'$. It is assumed that the service channel is subject to breakdowns occurring randomly in time. As the result of a breakdown, the service channel waits for the repairs to start and this waiting time (termed as the set-up time or delay time for repairs) is assumed to be general. Further, the repair times are also assumed to be general. We employ the supplementary variable technique using two supplementary variables, one each for the elapsed delay time and the elapsed repair time. We derive the queue size distribution for this system at a random epoch under the steady state conditions. Further, we derive some important performance measures of this system. This extends the models earlier studied by the present author Madan [22, 25].