

Working Vacation Queue with Service Interruption and Multi Optional Repair

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Abstract

In this investigation, we deal with a state dependent $M/E_k/1$ queuing system with working vacation (WV), service interruption and multi-optional repair. When the system becomes empty, the server leaves the system and takes working vacation for random time during which he may perform some secondary work. The server is also subjected to breakdown and requires multi optional repair for restoration. The vacation time and the life time of the server are exponentially distributed. The service times are assumed to be Erlangian distributed for both working vacation and busy states of the server. The customers arrive at the service station according to Poisson process with rates dependent upon the status of the server. We employ a generating function technique to obtain the expected number of customers and other system characteristics. The cost function is constructed by considering different cost elements of the system states. By taking illustration, numerical experiment is performed to validate the analytical results. The sensitivity analysis has also been done to examine the effect of different parameters on the system performance characteristics.

Keywords: $M/E_k/1$ queue, state dependent rates, working vacation, multi-optional repair, probability generating function, queue size.