QUEUEING SYSTEM WITH INTERDEPENDENT ARRIVAL AND SERVICE PROCESSES

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ABSTRACT

In this paper, we consider the single server queueing system having the interdependent arrival the service processes with bulk service. Here, we consider that the customers are served k at a time except when less then k are in the system and ready for service at which time customers are served.

KEYWORD

Interdependent queueing models, arrival process, service process, waitng line system, mean dependence.

OPTIMIZATION $M/M^{[K]}/1$ QUEUEING MODEL WITH VARYING BATCH SIZE:

In this sort of systems, the interdependence can be induced by considering the dependence structure with parameters λ, μ and $\in$ as marginal arrival rate, service rate and mean dependence rate respectively.

Let $P_n(t)$ be the probability that there are n customers in the system at time t. The difference – differential equations of the model are,

$$P'_n(t) = -(\lambda + \mu - 2\in)P_n(t) + (\lambda-\in)P_{n-1}(t) + P_{n-k}(t) \;\; ; \;\; n \geq 1$$

$$P'_0(t) = -(\lambda-\in)P_0(t) + (\mu-\in)\sum_{i=1}^{k} P_i(t) \qquad \ldots\ldots\ldots(1)$$

Assuming that, the system reached the steady state, the transition equations of the model are,

$$-(\lambda + \mu - 2\in)P_n + (\lambda-\in)P_{n-1} + (\mu-\in)P_{n-k} = 0 \qquad ; \; n \geq 1$$

$$-(\lambda-\in)P_0 + (\mu-\in)\sum_{i=1}^{k} P_i = 0 \qquad \ldots\ldots\ldots\ldots(2)$$