TWO SERVER INTERDEPENDENT QUEUEING MODEL WITH BULK SERVICE

[1]Shavej Ali Siddiqui
ORCID ID: 0000-0002-4758-7238
[1]Assistant Professor (Mathematics)
[1]Department of Applied Sciences and Humanities
Khwaja Moinuddin Chishti Language University, Lucknow (U.P.), India

ABSTRACT

In this Paper, two server interdependent queuing model with bulk service is considered for analysis. This model is an extension of the models discussed. we assumed that the bulk service is process is having two service facilities with capacities b_1 and b_2. A batch of b_1 units or the whole queue length whichever is smaller is taken from the head of the queue for service in the first channel whenever it is free. Similarly, the second channel on becoming free takes b_2 (δ b_1) or the whole queue length whichever is less. If both the servers are idle and there is no queue the next unit to arrive always goes to the first service facility.

KEYWORD

In both the models we first develop the difference-differential equations and solve them through generating function techniques. The system characteristics are derived and analyzed in the presence of the dependence parameter.

1.1 TWO SERVER INTERDEPENDENT QUEUEING MODEL WITH BULK SERVICE

In this section, the two-server queuing model with bulk service having interdependent arrival and service processes is considered, the two service facilities function independent of each other. We assume the arrivals are poissonian with the mean arrival rate λ .The marginal distributions of the service time in the two service facilities are exponential with the mean service rates μ_1 and μ_2. respectively. Then the conditional process of the number of service completions of the first service facility given that the number of arrivals is of the form,

$$P(X_{11} = n_1 \,/\, X_2 = n_2 ;\; t) = -(\mu_1 - \epsilon_1)t \sum_{j=0}^{min(n_1,n_2)} \binom{n_1}{j} \left(\frac{\epsilon_1}{\lambda}\right) \left(\frac{\lambda-\epsilon_1}{\lambda}\right)^{n_2-j} \frac{[(\mu_1-\epsilon_1)t]^{n_1-j}}{(n_1-j)!} \quad (1.1.1)$$

Where

X_{11} is the number of service completions of the first service facility during time t.

X_2 is the number of arrivals during time t.

ϵ is the mean dependence rate.