Abstract

This paper develops and analyzes a two node tandem queueing model with phase type service having time and state dependent service rates. Here, it is assumed that the service processes of the two service stations follow non-homogenous Poisson processes and service rates are dependent on the number of customers in the queue connected to it. Using the difference-differential equations, the joint probability generating function of the queue size distribution is derived. The system performance measures such as average number of customers in the queue, throughput of the service stations, and average waiting time of customers in the queue and in the system and the variance of the number of customers in each queue are derived. A numerical illustration is presented. The sensitivity analysis of the model revealed that the time and load dependent service rates have significant influence on congestion of queues and waiting time. The transient analysis can predict the performance measures more accurately for small period of time. This model can also include some of the early models as particular cases.
References

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Index Terms

Computer Science

Applied Sciences

Keywords

Time dependent service rate, tandem queueing model, Non-homogeneous Poisson processes, performance measures, sensitivity analysis