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

2. Vol.41, No 6, PP 1107-1116.
6. Vol.20, No1, PP 33-64.
Two Node Tandem Queueing Model with Phase Type State and Time Dependent Service Rates

46. Srinivasa Rao, K., VAsanta, M.R., and Vijaya Kumar,
47. C. V. R.S., (2000), on an interdependent
48. communication Network, opsearch.37(2):134-143.
49. Suhasini, A.V.S. Srinivasa rao, K., Reddy, P.R.S.
50. (2012), Transient Analysis of Tandem Queuing model
51. with non-homogeneous Poisson bulk arrivals having
52. state dependent service rates, Sri Venkateswara
53. University, Department of Statistics, Andhra University,
55. Ward Whitt (2016), “Recent papers on the time-varying
56. single-server queue”.//http.pdfs.semanticsscholar.org//
58. time varying rates”. Stochastic Networks of the
61. with time varying rates for telecommunication
62. models”. Telecommunication system 21:2-4,173-204.

Index Terms

Computer Science

Applied Sciences

Keywords

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