International Journal of
Information
and
Management
Sciences

International Journal of Information and Management Sciences
28 (2017), 99-111. DOI:10.6186/IJIMS.2017.28.2.3

Performance Analysis and Cost Optimization of Non-Markovian Bulk Queue with 'p'- Entering Discipline during Multiple Adaptive Vacations

S. Jeyakumar[1] *and E. Rameshkumar*[2]

[1]Government Arts College and [2]CMS College of Science and Commerce

Abstract

The steady state analysis of $M^x/G/1$ queue with Multiple Adaptive Vacation (MAV), where the customers enter during the server vacations with probability 'p' ($0 \leq p \leq 1$) is considered. The server provides service to all the entering customers with service follows general distribution. Upon the system being found to be empty, the server immediately takes a vacation of random period. When the server returns to system after a vacation, if the queue length is still empty, he avails another vacation and so on until he completes M number of vacations in successions and the server remains idle and starts service when the server finds a customer in the queue. The probability generating function at an arbitrary time epoch is obtained using Supplementary variable technique. Basic system characteristics such as expected value of the length of the queue, busy period, idle time and expected value of the waiting time are obtained. Cost model is presented and algorithm for finding optimum cost is also presented for the proposed model. Numerical illustration is also provided.

Keywords: Bulk arrival, general service, multiple adaptive vacations, supplementary variable, dormant period, 'p'- entering discipline.

1. Introduction

Bulk queueing models have been analyzed extensively in the last three decades by few authors. Vacation queueing models have been the subject of interest to queueing theorists of deep study in recent years because of their usability in the current situations. The dormant period of the server is utilized to do the secondary jobs such as maintenance and repair work in the system. This forms the main characteristics feature of the server vacation model. Vacation of queueing systems acts an imperative role in many applications like modeling and analysis of computer, wireless networks, cognitive radio wireless mesh network area, designing local network area, signal communication system, and core banking etc.

The intention of this paper is to analyse and build the mathematical model for the situation that exists in wireless networks to save power, when signals comes from the base