ABSTRACT

In the present situation highways and expressways are built on the principle of BOT (Build- Operate - Transfer) for which toll fee is levied from the users for a period of 20-30 years from the time of allotment of the work. For the collection of toll fees a toll plaza containing more than one toll booth is built on highways. At the toll plaza each vehicle has to slow down and often wait before paying the toll at a toll booth and leaving the system. Because of operation of slowing down and stopping of vehicles at toll booths queues are formed on the upstream side of the plaza. Understanding the queuing pattern at a toll facility (plaza) is important because queues are a direct indication of expected delays and level of service at a plaza. In this thesis a Markov Chain formulation for the queuing process at a two-toll-booth toll plaza is presented. The model attempts to incorporate the choice behaviour exhibited by drivers while approaching the toll booth. Here, the probability that a driver will choose a given toll booth is modeled using a Logit model where the utility is assumed to depend on the queue lengths at both the queues. This formulation is utilized to model the queuing process at such a system under different assumptions on how drivers behave while choosing a toll booth at a toll plaza. The primary focus of this thesis work is to understand the queuing behavior near toll plaza and to find out the limiting probabilities of the queue length and finally the limiting probabilities are used to determine the storage space in terms of number of vehicles at such a toll plaza for a variety of assumption on driver behavior while choosing the Lanes.

Keywords: Toll Plaza, Markov Chain, Limiting Probability, Lane length.