CONCLUSIONS
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The main achievement of this thesis has been the study of development of single server batch service queueing models under multiple vacations by using probability generating techniques which are available in the literature of queueing theory. When solving the single server batch service queueing models under multiple vacation numerically, the results of system measures have been obtained effectively by using MATLAB SOFTWARE.

In Chapter 1, we explained the history of queueing theory and its development in various periods by eminent queueing theorists. To motivate the readers many real time examples have been provided. The components of queueing system are explained in detail with Kendall notation. Probability generating technique is explained to solve the queueing models and which are used in the consecutive chapters.

In chapter 2, we investigated a simpler system initially that is basic single server fixed batch service queueing system under multiple vacations. Closed form solutions have been obtained for system performance measures. Numerical and graphical studies have been dealt in detail manner. This chapter is extended further by introducing various concepts and discussed in the consecutive chapters.

In Chapter 3, we began by investigating the single server fixed batch service queueing system under multiple vacations by incorporating the concept catastrophe, when catastrophe occurs it destroyed all customers in the system and system becomes empty and the server becomes inactive and goes for vacation. This model has many applications in computer systems or networks. We have derived the formulae for mean number of customers in the queue and various measures. The behaviour of this model is completely justified by means of numerical and graphical studies. As the catastrophe rate tends to zero, we found that this model coincide with basic single server batch service queueing system under multiple vacation which is discussed in chapter 2.

In Chapter 4, we investigated a single server fixed batch service queueing system with negative arrival under multiple vacations. The concept of negative customers is very important in queueing theory it happens in many real time models. Negative customers have the effect of deleting some customer in the queue. In the simplest version, a negative arrival removes an ordinary positive customer or a random batch of positive customers according to some strategy. It is noted that the existence of a flow of negative arrivals provides a control mechanism to control excessive congestion at the queue and also assume that the negative
customers only act when the server is busy. Numerical and graphical studies have been dealt in large manner by varying negative arrival rate $\nu$. As the negative arrival rate $\nu \to 0$, we found that this model coincide with basic single server batch service queueing model which is discussed in chapter 2.

In Chapter 5, we investigated a single server fixed batch service queueing system under multiple vacations with unreliable server. The concepts of breakdown and repair of server are incorporated in this model. For instance, in manufacturing systems, the machine may breakdown due to machine or job related problems in computer systems, the machine may be subjected to scheduled backups and unpredictable failures. In these systems, server breakdown results in a period of unavailable time until it is repaired. The behaviour of this model is completely justified by means of numerical and graphical studies. As $\alpha \to 0$ and $\beta \to \infty$, this model becomes single server batch service queueing system which is discussed in Chapter 2.

In Chapter 6, we investigated a single server fixed batch service queueing system with gated service under multiple vacations. The concept of gated service is discussed in this model.

In Chapter 7, we investigated a single server fixed batch service queueing system with second optional service under multiple vacations. Second optional service plays a vital role in queueing systems. The server provides two phases of services namely essential service and second optional service. We can see the applications of second optional services in hospital services, production systems, bank services, computer and communication networks. For instance at a barber’s shop may need a hair-cut but only a part of the customers may need a shave after their hair-cut, at a gifts shop every customer may need to buy a gift, but only some of these customers may ask for wrapping, etc. Numerical and graphical studies have been dealt in large manner by varying arrival rate $\lambda$. As the value of $p \to 0$, we found that this model coincide with basic single server batch service queueing model which is discussed in chapter 2.

In Chapter 8, we investigated a single server fixed batch service queueing system with Bernoulli schedule under multiple vacations. The behaviour of this model is completely justified by means of numerical and graphical studies. As the value of $p \to 0$, this model becomes single server batch service queueing system which is discussed in Chapter 2.
In Chapter 9, we began by investigating the single server fixed batch service queueing system under multiple vacations with loss and feedback. Concepts loss and feedback are introduced for customers only. Feedback queues play a vital role in the areas of Computer networks, Production systems subject to rework, Hospital management, Super markets and Banking business etc. The impatient behaviour of customer is also studied in this model (i.e.) the arriving customer may join the queue with probability p when the server is busy or in vacation. This probability p is called loss probability. We have derived the formulae for mean number of customers in the system and various measures. The behaviour of this model is completely justified by means of numerical and graphical studies. As the value of p→1 and q→0, this model becomes single server batch service queueing system which is discussed in Chapter 2.