CONCLUSIONS AND FUTURE WORK

In this research we considered the transient behavior of batch arrival non-Markovian queueing system $M^{[X_1]}_1, M^{[X_2]}_2/G_1, G_2/1$ with priority services and Bernoulli vacations. We assumed that two different kinds of customers namely, high priority and low priority customers, the arrival of customers to the system are in batches of variable sizes in two independent compound Poisson process, but are served individually under non-preemptive priority service rule by a single server accordingly “first come, first served” basis and the service time have been assumed to follow general distribution. Here we adopting two types of vacation one is after completion of service of last unit in the high priority queue the server may take a single vacation of random length and another one is Bernoulli scheduled vacation such that after completion of the each service the server may take a vacation with probability $\theta$ or stay in the system to serve customers with probability $(1 - \theta)$ if any.

We investigated this system by extending it in too more different advanced queueing systems by including different aspects such as balking, feedback, server breakdowns, server setup, restricted admissibility policy, retrial policy, negative arrival, collision, emergency vacation, extended vacation, reneging, working vacation and vacation interruption. In each chapter, we aimed to find the necessary and sufficient condition for the system to be stable, the closed form solution of important system performance measures, the proportion of idle time, the mean number of customers in the high priority queue and in the low priority queue/orbit, the mean waiting time in the high priority queue and in the low priority queue/orbit and reliability indices such as availability of the server, server failure density function of retrial queueing systems.
We applied supplementary variable technique to solve the system of equations by taking the elapsed service time, elapsed vacation time, elapsed repair time, elapsed delay time and the elapsed extended vacation time have been introduced as supplementary variables.

In this thesis we considered nine queueing models.

For all the models, the necessary and sufficient condition for the system to be stable and some useful system queue indices such as the mean queue size and the mean waiting time in the queue are obtained. Also some particular cases are discussed by dropping some assumptions of our models.

Numerical results and two dimensional graphs are presented for each of the queueing systems. These illustrations show the effect of arrival, vacation and breakdown parameters on the system performance indices. As a general observation, when the probability that the server takes a vacation or the rate of retrials increase or the rate of arrival of high priority or low priority increases, the utilization factor, the mean queue size and the mean waiting time of customer are all increases while the proportion of time that the server is idle decreases. The trends that have been found are expected.

As queueing models are very much useful in designing perspective. The queueing systems have been studied in this research and the results obtained, can be used to model many real problems where the servers are not continuously available for providing service for arriving customers and the server meets breakdown from time to time in different manner. These results provide essential information useful for management sectors, manufacturing industries, computer networks, telecommunication networks and other fields where decisions on systems having queues is vital.
Future Work

Based on the results found in this research, the researcher suggests further development to be conducted on the following queueing systems:

(i) Batch arrival queueing systems with preemptive priority service that includes customer impatience behavior retention of reneging.

(ii) Batch arrival queueing systems with preemptive priority service random breakdowns, Bernoulli schedule vacations and \( i \geq 1 \) stages heterogeneous service in which the breakdown rates are different for the \( i \) stages of service.

(iii) Batch arrival queueing systems with preemptive priority service, setup time and repair time are generally distributed.

(iv) To determine a control policy which gives the best estimate for the probabilities and which minimizes the total cost of the service system in retrial queueing systems.

(v) Queueing systems with preemptive priority batch service by considering different vacation policies.

(vi) Batch arrival multi server queueing systems with different vacations policies.