PREFACE

The present work is being supplicated for the award of the Ph.D. degree in Mathematics, in the Faculty of Science, Dr. R.M.L. Avadh University, Faizabad. It embodies the results of the researches carried out by me in the Department of Mathematics and Statistics, Dr. R.M.L. Avadh University, Faizabad during the period 1996-2000.

The thesis consists of five chapters, each divided into several sections (progressively numbered 1.1, 1.2, etc.) The equations and results in the text have been numbered serially, section and chapter wise, e.g. (3.2.1.) means first result of second section of the third chapter. The references cited have been arranged alphabetically and yearwise at the end of each chapter.

The first chapter comprises mainly of a historical account of queueing theory like the input process, the queue discipline, the service mechanism, roles of Poisson and exponential distribution, Erlang distribution, birth and death process and Markov process. Different unifications given by various authors have been arranged yearwise. In the end, a list of preliminary results and notations, used throughout the present thesis, has been given. These notations and results are of immense use for simplifying the entire work.

Second chapter is divided into two sections namely section
2.1 and 2.2. In section 2.1 we consider an $M^\infty/G/1$ queueing system in which the server takes a vacation each time that the system becomes empty. Using supplementary variables, we derive the general queue length distribution at an arbitrary time. We also obtain the waiting time and busy period. Section 2.2 deals with the length of a busy cycle and its mean for $M^\infty/G/n$ queueing model. Here purposely, we have introduced n servers along with conditions that arrival rate is constant i.e. $\lambda_1 = \lambda_2 = \cdots = \lambda_n = \lambda$. We have derived the length of a busy cycle and the steady state waiting time. The section concludes with the comparative analysis of the model under consideration and the model considered by previous authors.

The distribution of arrival of patients in transient state condition in health services, taking into account the balked patients, forms the basis of the third chapter. We also investigate the interarrival time distribution, its mean and variance. Distribution of departing patients (served or unserved) and departure time distribution are also obtained in subsequent sections. Finally the chapter is concluded with mean and variance of the departure time distribution.

Fourth chapter is devoted to the study of a monopoly service facility offering multi-prices for that one service. Pre-emptive resume and non-preemptive disciplines have been compared and interesting conclusions are drawn.

In chapter five queueing analysis is conducted for $M/G/1$
type systems with multiple classes of service requests that need a setup
time prior to each busy period. We consider FIFO (first-in, first-out) and
LIFO (last-in, first-out) service disciplines. The Laplace-Stieltjes transform
of the distribution function, the mean, and the second moment of the
waiting time for both disciplines are derived.