Queueing theory has been studied thoroughly through this century, but many queueing systems arising in realistic situations such as production lines and scheduling still need further attention.

The present thesis is devoted to the study of some problems in scheduling and queues in tandem wherein mathematical derivations of the models are given. The thesis is divided into five chapters, starting with an introductory chapter which review the related literature for the problems dealt with in the remaining chapters. The second, Third, and Fourth chapters are devoted to the study of some problems in scheduling theory. Chapter five is devoted mainly to some problems encountered in queues in tandem. A short review of literature is added to each chapter.

In chapter 1 we review the development of queueing theory in the recent years. The initial development of queueing networks theory may be seen since 1954 (tandem queues) and 1957 (queueing networks). The literature on the subject has grown very rapidly. We trace the directions and development of queueing networks literature in recent years.

Chapter Two, is devoted to the study of a two machine production scheduling problem in which the machines are in tandem and there is a single transport facility which carries processed items from a machine (Machine 1) to another machine (Machine 2). The machine 2 returns the empty carrier to machine 1. The optimal
schedule of items which minimizes the total production time is obtained. Also we consider the problem of scheduling n items on 3-machines in tandem where two transport agents are available for carrying the items finish on machine 1 to machine 2 for processing. An algorithm is proposed to obtain the optimal solution. The special case of break-down intervals of machines is also investigated. Furthermore, we consider the problem of scheduling n items on m machines in tandem where the concept of transportation times is involved.

Chapter Three, deals with a two machine tandem queueing system and a transportation time between the two machines, where we introduce the idea of "equivalent item for item block". The problem involving weighted items and break-down interval of machines is also considered. A heuristic procedure is presented for obtaining an optimal solution to the problem. In the second part of the Chapter we extend the results to m-machines.

In Chapter Four, we consider the problem of scheduling n items on two machines in tandem where the finished items have to undergo the inspection. The processing time of each item on each machine and the inspection unit is assumed to be distributed exponentially, with a known mean. The objective is to find an optimal scheduling. A scheduling heuristic rule and a numerical example are given at the end of the chapter.

In Chapter Five, we consider a tandem queue consisting of two service stations each having a single server where we assume that
the system is initially empty. The arrival process is assumed to be arbitrary and all service times are assumed to be mutually independent and also independent of the arrival process. We show that the departure process of customers from the last is statistically equivalent for the interchange of the two servers. Also we discuss the problem of finding the optimum order for two servers in tandem when no queues are allowed to be formed in front of either servers.

The thesis is accompanied by a bibliography containing articles and books of reference. A computer programme is also appended which is used for solving the numerical problems in the thesis.

The following material relating to my thesis contents has been either published or accepted for publication:


2) "Scheduling of Items on two Machines in Tandem Involving Transportation Time, Items-Block, Weighted Items and Break-Down Intervals of Machines" (PAMS-Accepted).

3) "A Bibliography on the Theory of Queueing Networks" (JISSOR-Accepted).

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