ON SOME PROBLEMS OF OPTIMAL SCHEDULING AND QUEUES IN TANDEM

ABSTRACT

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ABSTRACT

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The present thesis is concerned with the study of some problems in scheduling and queues in tandem. The thesis consists of five chapters, starting with an introductory chapter which reviews the related literature. The second, third, and fourth chapters are devoted to the study of some problems in scheduling theory. Chapter five is devoted to the problem of interchange of servers in tandem queues. A short review of literature is added to each chapter.

In Chapter 1 we review the development of queueing theory in the recent years. As the literature on the subject has grown very rapidly, we have traced mainly the directions and development of queueing networks literature in recent years, which is the subject matter in the subsequent chapters.

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). From machine 2 the empty transport facility returns to machine 1. The optimal schedule of items which minimize the total production time is obtained. Also we consider the problem of scheduling n items on 3-machines in tandem where a transport facility is available for carrying the items finished on a machine to another machine 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 with the concept of transportation time. In chapter Three, we deal with a two machine tandem queueing system with the idea of equivalent item for "item-block". The problems involving weighted items and break-down intervals of machines are also considered. A heuristic procedure is presented for obtaining an optimal solution. In the second part of the chapter we extend this problem to m-machines instead of two.

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 and the service times on the two machines are exponentially distributed with a known mean. The objective is to find a schedule for the n items on the two machines so that the expected total completion times of all the items is minimized. 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 with positive transportation time between them. We assume the system to be initially empty. The arrival process is arbitrary. All service times are assumed mutually independent and also independent of the arrival process. We show that the departure process of customers from the last station does not change (statistically equivalent) by the interchange of the two servers. Also we discuss the problem of finding the optimal order for two servers in tandem when no queues are allowed to be formed infront of servers.

The references are given in the end. The Computer programme for solving the various numerical problems are appended.