# SOME PROBLEMS IN QUEUEING THEORY

by

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# SUMMARY.

This thesis is in two parts.

In PART ONE a method for determining the congestion in telecommunication networks is presented.

Chapter 1 contains a review of some of the various ways that congestions in telecommunications networks have been determined. Problems associated with these methods will be pointed out.

Chapter 2 presents a method to determine the call congestion in a network in which only single link chains are used, some results will be presented.

In Chapter 3 the method discussed in Chapter 2 is extended to the case when multi-link chains are used.

Chapter 4 is the conclusion of this part of the thesis and contains a summary of the work described in this section as well as results obtained using our method.

PART TWO of this thesis presents a study of sensitivity bounds for certain queueing systems. A method to determine certain bounds is given and is used to find bounds on the time congestion in the $GI/M/n/n$ queueing system.

Chapter 5 contains an introduction to the topics of insensitivity and Generalised Semi-Markov Processes. Descriptions of various ways that have been used to determine bounds for some performance measures in some insensitive systems will also be presented.

Chapter 6 describes a method which can be used to determine the bounds on certain performance measures for Generalised Semi-Markov Processes in which

there is only one general lifetime distribution. A few examples of systems which can be analysed using this method will be given and some results presented.

In Chapter 7 the method described in Chapter 6 will be used to determine bounds on the time congestion in the $GI/M/n/n$ queueing system. A proof of this result will be presented for the case when $n = 2$, the full proof of this result is presented in the Appendix. A comparison of the maximum time congestion and the time congestion achieved using some well known arrival distributions will be presented.

Chapter 8 contains some conclusions and points out ways in which further research will extend these studies.