THE APPLICATION OF STATISTICAL METHODS IN SYSTEM RELIABILITY EVALUATION

A THESIS

Submitted to the Faculty of Engineering
in partial Fulfilment of the Requirements
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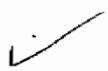

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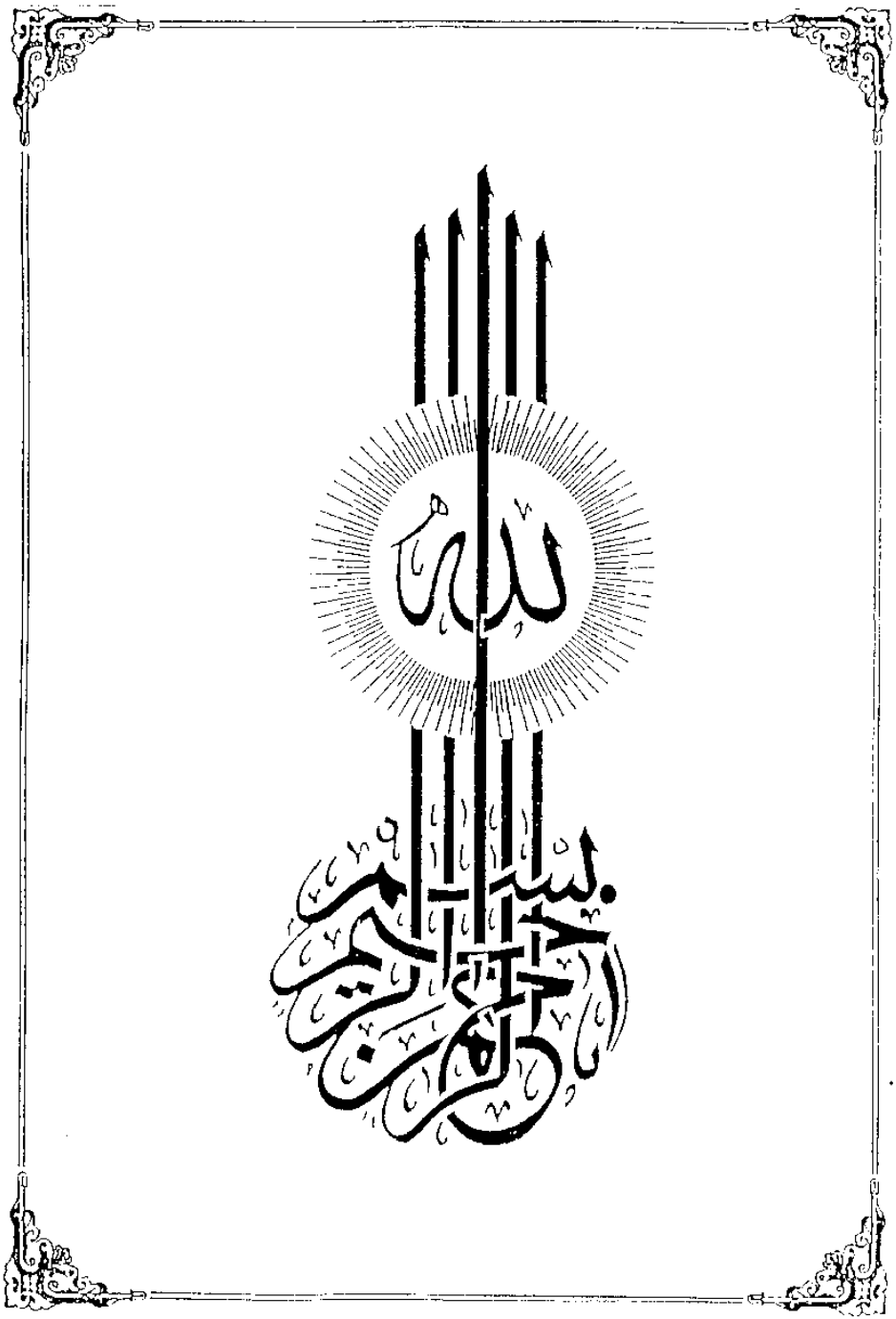

STATEMENT

This dissertation is submitted to Ain Shams University for the degree of Master of Science in Electronic Engineering.

The work included in this thesis was carried out by the author in the Department of Electronic and communication engineering .

No part of this thesis has been submitted for a degree or qualification at any other university of institution .

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TO MY

MOTHER , FATHER ,

SISTERS, AND BROTHERS

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AIN - SHAMS UNIVERISTY

"THE APPLICATION OF STATISTICAL METHODS IN SYSTEM RELIABILITY EVALUATION"

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ABSTRACT

The main purpose of this thesis is to apply the estimation theory and statistical methods for the evaluation of the reliability of both communication systems and electric power systems. This thesis contains the basic principles of reliability evaluation in systems, where different configurations of systems connection were presented and analyzed from the point of view of probability of failure. Some dynamic parameters related to reliability evaluation are defined and discussed such as system availability, mean up time, mean down time and mean time between failures. There are two examples the first is communication network reliability and the second is the satelitte communication system reliability, where different criteria are used for each example. A survey of the generating capacity adequacy criteria utilized by power utilities and systems is presented. Definition and the mathematical analysis of the most widely adopted reliability indices of generation planning is illustrated. A review of different statistical estimation is presented. The maximum liklihood method is recommended to better estimate the load duration curve which will be used for evaluating the reliability index. The load and generation models of the Egyptian unified power system are developed. The analysis carried out in this thesis used LOTUS/123 software program as a tool for the development of the load model. A series of loss of load expectation (LOLE) studies are carried out using a computer program for future different study scenarios, and for the generation expansion plan proposed and adopted by the Egyptian Electricity Authority. The studies of this thesis, determine different generation expansion plans (timing and size of additional generation units) depending upon different scenarios. The studies also, yield the effective capacities of the additional generating units as well as the equivelant percentage reserve margin which corresponds to different LOLE values.

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