THE INFLUENCE OF THE TYPE OF GENERATING UNIT CONTROL ON THE PERFORMANCE OF THE EGYPTIAN UNIFIED POWER SYSTEM .....

621.3192
B.M

A THESIS PRESENTED TO

FACULTY OF ENGINEERING
AIN SHAMS UNIVERSITY

BY ENG. BASSIONY M. EL-BARADIE

FOR THE PH.D. DEGREE IN ELECTRICAL ENGINEERING

SUPERVISED BY

PROF. Dr. Mohamed. A. Badr
ELECTRICAL POWER & MACHINES DEPT.
FACULTY OF ENGINEERING
AIN SHAMS UNIVERSITY

Dr. H. M. El-Shaer
DEPUTY CHAIRMAN
EGYPTIAN ELECTRICITY AUTHORITY

CAIRO 1985

Central Library - Ain Shams University

ACKNOWLEDGMENT

The author wishes to acknowledge the help he received from Professors, Dr. E.A. Mansour, of the Electrical Power & Machines Department & Dr. M.A. Sheirah, of the Automatic Control and Computer Science Department, both of the Faculty of Engineering, Ain Shams University during the stage of formulating the problem of research.

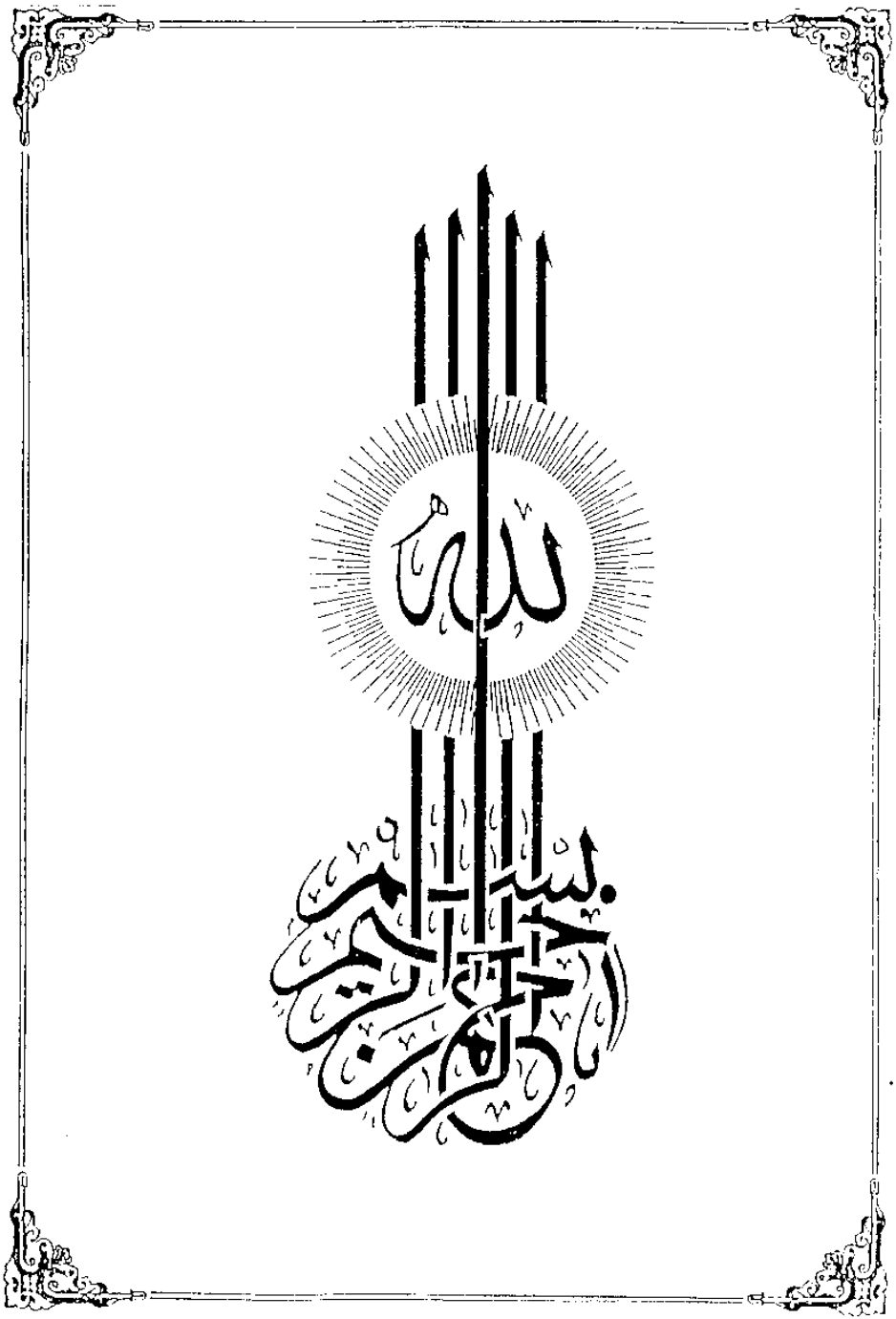
He, also wishes to express his sincere thanks, his indebtedness and his unlimited gratitude to Prof. Dr. M.A.L. Badr & Dr. A.A. Metwally, Ain Shams University for their valuable guidance and fruitfull discussions which resulted in the accomplishment of the thesis in the final form.

Thanks are also due to Dr. Hamdy El-Shaer, Deputy Chairman of Operation E.E.A. for his valuable comments and helpful criticism.

Appreciation is extended to Eng. A. Amin, E.E.A. Technical Consultant, Dr. Mohsen Ibrahim, Mr. Helmi Tolba and Eng. Ayman El Baradie for their valuable assistance and encouragement.

Finally, the author wishes to thank his wife, his daughter, and his sons for their help and the convenient atmosphere they created during this work.

Central Library - Ain Shams University



Central Library - Ain Shams University

E X A M I N E R S

1. Prof. Dr. M. Ahmed El Arabaty
   Head of Electrical Power & Machines Dept.
   Faculty of Engineering,
   Ain Shams University,
   Cairo - Egypt.

2. Dr. E.R. Lybrand
   Manager of Power Systems R & D
   Moore Systems Inc.
   San Jose, California,
   U.S.A.

3. Prof. Dr. M.A.L. Badr
   Electrical Power & Machines Dept.
   Faculty of Engineering,
   Ain Shams University,
   Cairo - Egypt.

4. Dr. H.M. El-Shaer
   Deputy Chairman
   Egyptian Electricity Authority
   Cairo - Egypt.

Central Library - Ain Shams University

A B S T R A C T

The objective of this thesis is to determine the best type of control to be applied to the generating units of the Egyptian Unified Power System in order to keep the network frequency within allowable limits.

Four different types of generating units (large steam, small steam, gas and hydro) are found in the Egyptian Power System. Each of these types is modeled mathematically and used individually for studying the performance of each of four types of control strategies. The control strategies considered are the proportional plus integral, optimal, suboptimal, and self tuning regulators.

Studies are performed to determine the performance of each of the four control schemes when applied to each of the four generator types. In order to facilitate the comparison between the different control schemes, the same load disturbance pattern was used in all tests and performance indices were measured in each case.

The effect of including boiler dynamics in the steam units models is also studied.

Central Library - Ain Shams University

After the best controller for each unit type was determined, the different generator models were integrated to form a model for the whole system and the system's response to load disturbance is studied.

Central Library - Ain Shams University

C O N T E N T S

Central Library - Ain Shams University

Central Library - Ain Shams University

Central Library - Ain Shams University

Central Library - Ain Shams University

Central Library - Ain Shams University

Central Library - Ain Shams University

LIST OF FIGURES

Central Library - Ain Shams University

Central Library - Ain Shams University

Central Library - Ain Shams University