

ROBUST CONTROL POWER SYSTEM STABILIZER USING LMI APPROACH

AHMAD JOHARI B MOHAMAD

GK030027

DRAFT THESIS 1

FACULTY OF ELECTRICAL ENGINEERING

KUITTHO

OCT 2004

TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
1	INTRODUCTION	1
	1.1 Objective	5
	1.2 Scope of the project	6
2	LITERATURE REVIEW	7
3	METHODOLOGY	10
	3.1 Linearized Model using PSD	11
	3.2 H_{∞} Controller	13
	3.3 Efficacy of the system	15
4	RESULT AND DISCUSSION	16
	4.1 Frequency response of the weighting function	17
	4.2 Model Reduction of Controller	18
	4.3 Performance of LMI approach	19
	4.4 Case study I	20
	4.5 Case study II	22
	4.6 Case study III	24
5	CONCLUSION	26
	REFERENCES	27-29
	Appendixes A – D	30 -

LIST OF TABLES

TABLE NO	TITLE	PAGE
4.1	Performance Index	19
4.2	Design Controller for case study I	20
4.3	Design Controller for case study II	22
4.4	Design Controller for case study III	24

LIST OF FIGURES

FIGURE NO	TITLE	PAGE
1.1	Power System Control Diagram	3
3.1	General Power System Diagram with LMI-PSS	11
3.2	Single Machine Infinite Bus with LMI PSS controller	12
3.3	General Control Structure	13
3.4	Plant Model	14
3.5	Controller Model	14
3.6	Nonlinear based optimisation controller diagram	15
4.1	Single Bus Infinite Bus System	16
4.2	Bode Magnitude Diagram of weighting function	17
4.3	Full order controllers	18
4.4	Reduced order controllers	18
4.5	Generator Power Deviations (Frequency)	21
4.6	Generator Power Deviations (Electrical Power)	23
4.7	Generator Power Deviations (Frequency and Electrical Power)	25

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
A	PSD Files	30
B	Generator Model	31 - 36
C	Exciter Model	37 - 40
D	Governor Model	41 - 47

PERPUSTAKAAN UMP



0000034446

Abstract

Robust control theory considers a fundamental and practically important issue in power system environment. It turns out that many of the simplest questions are very difficult to solve, but researchers have made considerable progress over the last twenty years. Recent techniques of robust control theory, based on convex optimization over linear matrix inequalities (LMIs) might change this. In this project, robust design of power system stabilizers is considered. A new approach is presented that utilizes recently developed techniques based on LMI for mixed H_2/H_∞ design. The design is easily carried out by solving a standard LMI problem. Simulation results on a single machine infinite bus system illustrate the technique, and results are compared with Nonlinear Based Optimization approach.