

CONTENTS

Sr No	TITLE	Page No
Certificate		I
Declaration.....		II
Acknowledgement		III
Abstract.....		IV
List of Tables		XI
List of Figures.....		XII
List of Photographs.....		XVI
List of Acronyms		XVII
1. INTRODUCTION.....		1
1.1 General Control structure.....		1
1.2 Aim and research scope		3
1.3 Outcome of research work		9
1.4 Organization of thesis		10
2. SYSTEM SOLUTION: PREVAILING TECHNIQUES		14
2.1 Introduction.....		14
2.2 Review of complex control methods		16
2.2.1 Classical control.....		16
2.2.2 Intelligent control.....		17
2.2.3 Smart Control.....		18
2.2.4 Adaptive control		19
2.3 Discovering of control problem.....		21
2.3.1 Complex control problem		21

2.3.2 General Problems with Intelligent Controller.....	22
2.3.3 Structuring of control problem	22
2.3.4 Structuring a control problem for power system stabilization.....	23
2.3.5 Development of the structure for the multiple model adaptive controllers	24
2.4 Concluding Remarks.....	25
3. MATHEMATICAL MODELLING OF CONTROLLERS.....	26
3.1 Introduction.....	26
3.2 Performance evaluation: Intelligent control (Fuzzy Logic Control).....	26
3.2.1 Mathematical modeling of conventional power system stabilizer	26
3.3 Design Steps for Fuzzy Logic (Intelligent) controller	38
3.4 Performance evaluation: Smart control	41
3.4.1 Design steps for ANN Implementation	41
3.4.2 Artificial neural network based Power system stabilizer	42
3.5 Concluding Remarks.....	43
4. TESTING PERFORMANCE OF CONTROLLERS.....	44
4.1 Introduction.....	44
4.2 Simulation of Conventional power system stabilizer (CPSS)	45
4.2.1 Single Machine Infinite Bus System	45
4.2.2 Multimachine System	46
4.3. Simulation of single machine infinite bus system with FPSS	54
4.4. Simulation of ANN based PSS	56
4.5 Comparative assessment of Intelligent and smart controller performance	57
4.5.1 Comparison of various controller design for SMIB system	57
4.5.2 Comparison of control parameters of SMIB system	58
4.5.3 Comparison of controller design for Multimachine system	59
4.5.4 Comparison of control parameters of Multimachine system	69
4.6 Concluding Remarks.....	70

5. REAL TIME IMPLEMENTATION USING DSP 28335	71
5.1 Introduction.....	71
5.2 Code generation using CCS v3.3 for TMS320F28335	71
5.2.1 Steps to generate optimized C code.....	72
5.2.2 Real-Time Workshop.....	72
5.2.3 Additional key features of TMS320F28335	73
5.3 Generation of PIL configuration.....	73
5.4 Generation of HIL configuration	75
5.5HIL Implementation for power system stabilization	77
5.5.1 Single machine Infinite bus system	77
5.5.2 Multimachine system.....	78
5.6 Concluding Remarks.....	82
6. PERFORMANCE ANALYSIS OF ROBUST MULTIPLE MODEL ADAPTIVE CONTROLLER.....	83
6.1 Introduction.....	83
6.2 Design of various controller for power system stabilization	83
6.2.1 Conventional controller	83
6.2.2 Intelligent controller	83
6.2.3 Smart controller	84
6.3 Fuzzy logic based Robust MMAC.....	85
6.3.1 Fuzzy Sets	85
6.3.2 Fuzzy Rule base	86
6.2.3 Fuzzy inference procedure.....	87
6.4 Concluding Remarks.....	92
7. CONCLUSION AND FUTURE SCOPES.....	93
7.1 Research contributions.....	93
7.1.1 Controller performance assessment.....	93

7.1.2 Multiobjective Optimization.....	95
7.1.3 Real time implementation.....	96
7.1.4 Design & Implementation of Robust MMAC	97
7.1.5 Overall conclusion	97
7.2 Future Scopes.....	97
BIBLIOGRAPHY	99
APPENDIX A	115
SOFTWARE DEVELOPMENT	115
A1>List Software used to develop the algorithm	115
A2:Graphical user interface development (GUI).....	115
A3:Simulink files.....	116
A4:MATLAB files.....	117
A5:FUZZY files.....	117
APPENDIX B	118
SYSTEM DATA.....	118
B1:Single Machine Data	118
B2:Multimachine Data.....	120
APPENDIX C	121
LIST OF RESEARCH PUBLICATIONS	121
C1:International Journal.....	121
C2:Peer-reviewed international conferences	121
C3:Conference Proceeding	122
C4: Under preparation.....	122
APPENDIX D	123
PHOTOGALLERY	123
APPENDIX E	123

SOFT COMPUTATIONAL FIELDS	126
E.1 Introduction	126
E.2.1 Main features and capabilities of MATLAB.....	127
E.2.2 Simulink	129
E.2.3 Toolboxes	132
E.3 Fuzzy logic control system	134
E.3.1 Design of fuzzy logic controller.....	136
E.3.2 Fuzzy implication methods	137
E.4 Artificial Neural Network.....	137
E.4.1 The Biological Inspiration.....	138
E.4.2 Single layer and multi-layer networks	139
E.4.3 Types of neural network learning.....	140
E.4.4 Procedure for ANN Implementation	141
E.5 Genetic Algorithm	141
E.5.1 Solution Representation: The Chromosome Structure	142
E.5.2 General Rules to Set Parameters of Genetic Algorithm.....	143
E.6 Particle Swarm Optimization	144
E.6.1 Basic of Particle Swarm Optimization	144
E.6.2 General Procedure of PSO algorithm.....	144
E.7 Code Composer Studio.....	145
E.7.1 Integrated development environment (IDE)	145
E.7.2 DSP/BIOS	146
E.7.3 Analysis & Evaluation tools.....	147
E.8 Concluding Remarks	147