

TABLE OF CONTENTS

	Page
Acknowledgements	iii
Abstract in Thai	iv
Abstract in English	vi
List of illustrations	x
Chapter 1 Introduction	1
Chapter 2 Preliminaries	3
2.1 Stability.	3
2.1.1 Definition.	3
2.1.2 Algebraic Criteria for Linear Systems.	4
2.1.3 Lyapunov Theory.	4
2.1.4 Application of Lyapunov Theory to Linear Systems.	5
2.2 Routh-Hurwitz Theorem.	5
2.3 Fourth-Order Runge-Kutta Method.	6
2.4 Matrix Types.	7
2.4.1 Hermitian Matrix.	7
2.4.2 Positive Definite Matrix.	7
2.4.3 Positive Semidefinite Matrix.	7
2.4.4 Negative Definite Matrix.	8
2.4.5 Negative Semidefinite Matrix.	8
2.5 Synchronization.	8
2.6 Terminology.	9
Chapter 3 Main results	10
3.1 Chen Chaotic Dynamical System.	10

3.1.1 Numerical Simulations.	13
3.2 The Perturbed Chen Chaotic Dynamical System.	15
3.2.1 Numerical Simulations.	18
3.3 Controlling Chaos of Perturbed Chen System to Equilibrium Point.	20
3.3.1 Feedback Control Method.	20
3.3.2 Bounded Feedback Control Method.	27
3.4 Synchronization of Perturbed Chen Chaotic dynamical system.	35
3.4.1 Synchronization of Perturbed Chen Chaotic Dynamical System Using Active Control.	36
3.4.2 Adaptive Synchronization of Perturbed Chen Chaotic Dynamical System	41
Chapter 4 Conclusion	47
Bibliography	50
Vita	51

LIST OF ILLUSTRATIONS

Figure	Page
3.1 The chaotic attractor of Chen chaotic dynamical system in the xy -plane.	13
3.2 The chaotic attractor of Chen chaotic dynamical system in the xz -plane.	14
3.3 The chaotic attractor of Chen chaotic dynamical system in the yz -plane.	14
3.4 The chaotic attractor of perturbed Chen chaotic dynamical system in the xy -plane.	19
3.5 The chaotic attractor of perturbed Chen chaotic dynamical system in the xz -plane.	19
3.6 The chaotic attractor of perturbed Chen chaotic dynamical system in the yz -plane.	20
3.7 The time responses for the states x , y and z of the controlled system before and after control activation with time.	25
3.8 The time responses for the states x , y and z of the controlled system before and after control activation with time.	26
3.9 The time responses for the states x , y and z of the controlled system before and after control activation with time.	26
3.10 The states x of the controlled system and the control $u(t)$ respond with time before and after control activation.	31
3.11 The states y of the controlled system and the control $u(t)$ respond with time before and after control activation.	31
3.12 The states z of the controlled system and the control $u(t)$ respond with time before and after control activation.	32
3.13 The states x of the controlled system and the control $u(t)$ respond with time before and after control activation.	32

3.14	The states y of the controlled system and the control $u(t)$ respond with time before and after control activation.	33
3.15	The states z of the controlled system and the control $u(t)$ respond with time before and after control activation.	33
3.16	The states x of the controlled system and the control $u(t)$ respond with time before and after control activation.	34
3.17	The states y of the controlled system and the control $u(t)$ respond with time before and after control activation.	34
3.18	The states z of the controlled system and the control $u(t)$ respond with time before and after control activation.	35
3.19	The states x_1, x_2 of the coupled perturbed Chen system of equations with the active control deactivated.	38
3.20	The states y_1, y_2 of the coupled perturbed Chen system of equations with the active control deactivated.	38
3.21	The states z_1, z_2 of the coupled perturbed Chen system of equations with the active control deactivated.	39
3.22	The states x_1, x_2 of the coupled perturbed Chen system of equations with the active control activated.	39
3.23	The states y_1, y_2 of the coupled perturbed Chen system of equations with the active control activated.	40
3.24	The states z_1, z_2 of the coupled perturbed Chen system of equations with the active control activated.	40
3.25	Synchronization errors: $ e_x $	44
3.26	Synchronization errors: $ e_y $	45
3.27	Synchronization errors: $ e_z $	45
3.28	Changing parameters: \hat{a}	45
3.29	Changing parameters: \hat{b}	46
3.30	Changing parameters: \hat{c}	46
3.31	Changing parameters: \hat{d}	46