

## **ACKNOWLEDGEMENTS**

I would like to express my appreciation to my advisor Assistant Professor Dr. Anirut Luadsong, who help and taught me about usability of the MATLAB model in order for the paper to be done well, for his valuable guidance, inspiration, verified and gave well counsel during work.

I would like to thank my committee member: Assistant Professor Dr. Surattana Sungnul from the Department of Mathematics, King Mongkut's University of Technology North Bangkok, Associate Professor Dr. Usa Humphries and Assistant Professor Dr. Sumlearng Chunrungsikul from the Department of Mathematics, King Mongkut's University of Technology Thonburi.

I would like to thank all the lecturers from the Department of Mathematics, King Mongkut's University of Technology Thonburi, who taught and advised me and I also wish to thank my family and my friends for all their encouraged me.

Finally, this thesis was supported by centre of excellence in mathematics (CEM).