CONTENTS

COVER i
APPROVAL PAGE ii
SELF DECLARATION AGAINST PLAGIARISM iii
ABSTRACT iv
ACKNOWLEDGMENTS v
PREFACE vi
CONTENTS vii
LIST OF TABLES ix
LIST OF FIGURES x
CHAPTER 1 INTRODUCTION 1
1.1 Backgrounnd 1
1.2 Problems Statement 2
1.3 Objectives 3
1.4 Hypotheses 3
1.5 Research Methodology 3
1.6 Problem Limitation 4
CHAPTER II REVIEW OF LITERATURE AND STUDIES 5
2.1 Photovoltaic 5
2.1.1 Photovoltaic Characteristics 6
2.1.2 Photovoltaic Modeling 6
2.2 Solar Panel Cooling System 9
2.2.1 Heat transfer and water cooling in solar panels 11
2.2.2 Raw dan Net Gain 13
2.2.3 Efficiency of solar panels 14
2.3 Artificial Intelligence 15
2.4 Intelligent control system 16
2.5 Fuzzy Logic Controller 17
2.5.1 Fuzification 18
2.5.2 Fuzzy Inference (Rule) 21

2.5.3 Defuzzification 23
CHAPTER III RESEARCH METHODOLOGY 26
3.1 Simulation flow 26
3.2 Hardware design for testing 27
3.3 Simulation System Design 30
3.3.1 Fuzzy logic modeling 30
3.4 Hardware design for fuzzy logic control testing 38
3.5 Test and analysis scheme 39
3.5.1 Simulation Scheme 39
3.5.2 Test Scheme 40
3.5.3 Analysis Scheme 40
CHAPTER IV DATA PRESENTATION AND ANALYSIS 42
4.1 Cooling System Test Results 42
4.2 Simulation Results 46
4.3 Fuzzy logic control test result on the colling system 59
4.4 Solar panel efficiency results 61
CHAPTER V CONCLUSIONS AND RECOMMENDATIONS (FUTURE WORKS) 62
5.1 Conclusions 62
5.2 Recommendations 63
REFERENCES 64
ATTACHMENT 67