

**ANT COLONY OPTIMIZATION FOR
SOLVING ECONOMIC DISPATCH OF POWER SYSTEM**

This thesis is presented in partial fulfillment for the award of the

Bachelor of Electrical Engineering (Hons)

UNIVERSITI TEKNOLOGI MARA



MUHAMMAD SHUKRI BIN CHE HASHIM

FACULTY OF ELECTRICAL ENGINEERING

40450 SHAH ALAM, SELANGOR DARUL EHSAN

**FACULTY OF ELECTRICAL ENGINEERING
UNIVERSITI TEKNOLOGI MARA**

ACKNOWLEDGEMENTS

BISMILLAHIRRAHMANIRRAHIM. First of all, I really would like to thank and syukur to Allah S.W.T for His permission and blessing to make this project successfully completed. Without His permission, it is impossible to make anything happen and be come true.

I would like to take this opportunity to sincerely express my highest appreciation to my project supervisor, Assoc. Prof. Bibi Norasiqin Sheikh Rahimullah for all her valuable guidance, teachings, suggestions, advices, and support throughout this project. With her supervision, I am able to complete the project.

I would like to extend my appreciation to all those who have helped making this journey worthwhile. My deepest thanks and appreciation to my family for their moral support and encouragement. To all my friends, who had together with me shared my highs and lows, thank you for all the opinions and suggestions.

Finally, I would like to thank all those who have contributed information, knowledge, ideas, time and effort directly or indirectly in the progression of this final year project. Honestly, I am very grateful for all their favors and support and I will remember in all of my life. Thank you so much again and may ALLAH S.W.T bless them.

ABSTRACT

Economic dispatch is the method of determining the most efficient, low-cost and reliable operation of a power system by dispatching the available electricity generation resources to supply the load on the system. The primary objective of economic dispatch is to minimize the total cost of generation while honoring the operational constraints of the available generation resources.

Economic load dispatch problem is allocating loads to plants for minimum cost while meeting the constraints. It is formulated as an optimization problem of minimizing the total fuel cost of all committed plant while meeting the demand and losses .The variants of the problems are numerous which model the objective and the constraints in different ways. The basic economic dispatch problem can described mathematically as minimization of the total fuel cost of all committed plants subject to the constraints.

In order to achieve the economic dispatch (ED) objective, an optimization technique will be required to find the optimal combinational power generator output of the system. In this study, an optimization technique called Ant Colony Optimization (ACO) had been applied in solving ED problem. An economic dispatch problem, consisting of six generating units is applied to compare the performance of the proposed method with those of genetic algorithm (GA) and simulated annealing (SA). ACO algorithm used in this study was implemented by using MATLAB 7.6.0 (R2008a). The experimental results show that the fuel cost obtained by the ACO is slightly lower than those of the GA and SA methods.

TABLE OF CONTENT

<u>CONTENTS</u>	<u>PAGES</u>
DECLARATION	i
ACKNOWLEDGEMENTS	ii
ABSTRACT	iii
TABLE OF CONTENT	iv
LIST OF FIGURES	vii
LIST OF TABLES	viii
CHAPTER 1: INTRODUCTION	1
1.1 Overview	1
1.2 Problem Statement	1
1.3 Objectives	2
1.4 Scope of Work	2
1.5 Thesis Organization	3
CHAPTER 2: LITERATURE REVIEW	4
2.1 Introduction	4
2.2 Economic Dispatch Basic Theory	4
2.3 Economic Dispatch Constraints	7
2.3.1 Inequality or Generation Limits Constraint	7
2.3.2 Power Balance Constraint	7
2.3.3 Total Power Losses, P_L	8

2.4	Computation Techniques	9
2.5	Ant Colony Optimization Method	10
2.6	Ant Colony Optimization Algorithm	13
2.7	Ant Colony Optimization Main Variants	16
2.8	<i>MAX-MIN</i> Ant System	17
2.9	Ant Colony System	19
2.9.1	Others	20
CHAPTER 3: METHODOLOGY		22
3.1	Introduction	22
3.2	ACO Initialization Process	22
3.3	Ant Direction Search	22
3.4	The pheromone updating	23
3.5	Estimation and selection	24
3.6	MATLAB Application	26
3.6.1	Overview of the MATLAB Environment	26
3.6.2	Script M-Files	27
3.6.3	The MATLAB System	27
3.6.4	Desktop Tools and Development Environment	28
3.6.5	Mathematical Function Library	28
3.6.6	The Language	28
3.6.7	External Interfaces	28
3.6.8	Application of MATLAB Function	28