# PARTICLE SWARM OPTIMIZATION TECHNIQUE FOR OPTIMIZNG LOAD FLOW ANALYSIS

**Thesis presented in partial fulfillment for the award of the Bachelor in Electrical Engineering (Hons) UNIVERSITI TEKNOLOGI MARA**


**MUHAMMAD SYAFIQ BIN MOHD ZAMAN**
**FACULTY OF ELECTRICAL ENGINEERING**
**UNIVERSITI TEKNOLOGI MARA**
**40450 Shah Alam, Malaysia**

**MEI 2009**

## ACKNOWLEDGEMENT

*Assalamu`alaikum W.B.T.....*

First of all, the entire glory and honor to Allah S.W.T for bounding blessing that He has given me a chance to accomplish this project report. With the guidance from Him, I have completed the paper work of Final Year Project (EEE 690).

Secondly, I would like to express my gratitude to my project supervisor; En Ahmad Ihsan B. Mohd Yassin which has given me ideas of what the stability issue is all about as well as the importance of it. Thank you very much for his concern and responsibility in giving the information as well as his precious time for the discussion consultation hours in completing the project. In addition, I also would like to express my appreciations to my family for the constant support in all aspects. Without the love form them, it will be worthless to complete this project.

Last but not least, I would like to thank again and I am very appreciate the guidance and assistance from the related parties in accomplished this report. Insya-ALLAH, I will fully utilize the knowledge that I obtained for the future sake of my life.

***Muhammad Syafiq B. Mohd Zaman,***
Faculty of Electrical Engineering,
Universiti Teknologi MARA
(UiTM),Shah Alam,
Selangor Darul Ehsan,Malaysia.

## ABSTRACT

The state of power system and methods of calculating this state are extremely important in evaluating the operation of the power system, the control of this system and the determination of future expansion for the power system. The state of power system is determined through load flow analysis that calculates the power flowing in the lines of the power system especially in determining the total losses in the power system.

Particle swarm optimization (PSO) is a stochastic global optimization algorithm inspired by social behavior of bird flocking in search of food, which is simple but powerful, and widely used as a problem solving technique to a variety of complex problems in science and engineering. The PSO technique was proposed to solve on Institute of Electrical & Electronic Engineers (IEEE) 30-bus system. The proposed technique was able to minimize the losses in the power system with results of losses minimization.



Key Words : Particle Swarm Optimization, Load Flow Analysis, Line Losses.

# TABLE OF CONTENTS

## 1.1 General

The computational solution of load flow has attracted much attention. Continuing research on numerical methods for load flow calculation is nevertheless justified by the considerable expenditure of computer resources and engineering effort on load flow analysis. Reduction of execution times allows the more effective use of computers, and increased robustness and accuracy contribute to the value of the analysis tool [2]. The recent introduction of scientific work-station computers, which provide network planning or operating engineers with integrated analysis and display systems, further emphasizes the need for fast and reliable load flow software. Improvements in solution accuracy and the ability to solve numerically difficult network problems permit the user to concentrate on the physical network rather than on its suitability for numerical analysis. Researchers, however, have been aware of the shortcoming of the classical solution algorithms i.e. Newton-Raphson(N-R) and Fast Decoupled Load Flow(FDLF) when they are generically implemented and applied to ill-conditioned and/or poorly initialized power system.

Hence commercial power flow packages always modify these algorithms for enhanced robustness. The most popular method (FDLF) cannot handle Q-limit violation easily. The Gauss-Seidel (G-S) power flow technique, another classical power flow method, has been shown to be extremely inefficient in solving large power systems as well as ill-conditioned ones, but it can handle bus violations with ease [1]. Omine reduction of the static power system model has been widely used to decrease the computational burden of the network solution. Many methods have been developed to compute the actual reduction, and network reduction programs are used in industry today [2]. One method of network reduction is to eliminate all the P-Q buses and retain only P-V buses; then P-V bus data is used in the iteration cycle to restore new values for P-Q bus voltages. This method for load flow analysis saves computer time [3] but it does not, however, take into account Q-limit violations, and its accuracy is not good because of the many approximations included. This method is simple, reliable, fast, and, compared with other techniques, can handle the adjusted solution with ease. The sparsity is exploited in the reduction step, and is very useful for offline and online applications.