AIN SHAMS UNIVERSITY

FACULTY OF ENGINEERING

Engineering Physics and Mathmatics

Modern Approaches for Optimal Power Flow

A Thesis submitted in partial fulfillment of the requirements of the degree of

Master of Science in Engineering Mathematics

(Engineering Physics and Mathmatics)

by

Amr Khaled Khamees Ali

Bachelor of Science in Electrical Engineering

(Electrical Power and Machines Engineering)

Faculty of Engineering, Ain shams university, 2011

Supervised By

Prof. Almoataz Youssef Abdelaziz

Prof. Niveen Mohamed Khalil Badra

Dr. Ahmed Mohamed Ibrahim El-Rafei

Cairo - (2017)

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Statement

This thesis is submitted as a partial fulfillment of Master of Science in Engineering Mathematics, Faculty of Engineering, Ain shams University.

The author carried out the work included in this thesis, and no part of it has been submitted for a degree or a qualification at any other scientific entity.

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Publications

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Thesis Summary

Optimal power flow (OPF) is a load flow study that uses optimization methods to adjust decision variables (control variables) to achieve best operation for the electrical system. OPF is a fundamental function of electrical system controlling and operation. It aims to estimate the best value for real generating power and bus voltage.

This research inspects OPF operating point which minimizes the total fuel cost while satisfying specific system constrains.

First, we make a brief review on the optimization approaches in general with numerical examples for multiobjective optimization approaches. Then, this thesis proposes solution for OPF issue by using two robust and effective evolutionary based (meta-heuristic) methods named "Shuffled Frog Leaping Algorithm" (SFLA) and "Grey Wolf Optimizer" (GWO). SFLA simulates the frogs' behavior while they search for food. GWO simulates the grey wolves' attitude when hunting for prey.

These techniques are simulated and examined on the "standard IEEE 30-bus (SIE-30) and standard IEEE 57-bus (SIE-57) systems". Moreover, the implementations of the two methods are examined and the simulation outcomes are compared with each other and also with other optimization techniques.

Keywords:

Optimum power flow, Shuffled Frog Leaping, Grey Wolf Optimizer, power system operation.

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