MULTIOBJECTIVE ECONOMIC LOAD DISPATCH USING WEIGHTING METHOD

A DISSERTATION SUBMITTED TO THE UNIVERSITY OF DELHI

FOR THE AWARD OF DEGREE OF

MASTER OF ENGINEERING

(CONTROL & INSTRUMENTATION)

Submitted by

CHETAN CHOUHAN

(University Roll No. 9022)

Under the supervision of

Prof. N. K. Jain

&

Dr. Uma Nangia

(Electrical Engineering Department)

Department of Electrical Engineering

DELHI COLLEGE OF ENGINEERING

Bawana road, Delhi-110042

2009 – 2011

CERTIFICATE

It is certified that **Mr. CHETAN CHOUHAN**, Roll No 9022, student of M.E, Control and Instrumentation, Department of Electrical Engineering, Delhi College of Engineering, has submitted the dissertation entitled **"MULTIOBJECTIVE ECONOMIC LOAD DISPATCH USING WEIGHTING METHOD''** under our guidance towards partial fulfillment of the requirements for the award of the degree of Master of Engineering (Control & Instrumentation Engineering).

This dissertation is a bonafide record of project work carried out by him under our guidance and supervision. His work is found to be outstanding and has not been done earlier.

I wish him success in all his endeavors.

Prof. N.K Jain

Electrical Engineering Department

Delhi College of Engineering

Dr. Uma Nangia

Electrical Engineering Department

Delhi College of Engineering

ACKNOWLEDGEMENT

The writing of this dissertation has been one of the most significant academic challenges I have ever had to face, without **GOD**'s blessings and support, patience and guidance of the following people, this study would not have been completed. It is to them that I owe my deepest gratitude.

- Prof. N.K Jain & Dr. Uma Nangia, Electrical Engineering Department, Delhi College of Engineering who undertook to act as my supervisor despite of their many other academic and professional commitments to the highest standards that inspired and motivated me.

- Prof. NARENDRA Kumar, Head, Electrical Engineering department, Delhi college of Engineering, New Delhi, for providing me with the best facilities in the Department and timely suggestions.

- My **C n I 'core'** group, who inspired my final report despite the enormous work pressures we are facing together.

- My Parents, who have always supported, encouraged and believed in me and patiently waited for my dreams to come true.

CHETAN CHOUHAN

ROLL NO 9022

ME (C&I)

ABSTRACT

In general, a large scale power system possesses multiple objectives to be achieved. The ideal power system operation is achieved when various objectives like cost of generation, system transmission loss, environmental pollution, security etc. are simultaneously attained with minimum values. Since these objectives are conflicting in nature, it is impossible to achieve the ideal power system operation.

In this thesis work, three objectives of Multiobjective Economic Load Dispatch (MOELD) problem-cost of generation, system transmission loss and environmental pollution- are considered. The MOELD problem is formulated as a multiobjective optimization problem using weighting method and a number of noninferior solutions are generated in 3D space. The optimal power system operation is attained by Ideal Distance Minimization method. This method employs the concept of an 'Ideal Point' (IP) to scalarize the problems having multiple objectives and it minimizes the Euclidean distance between IP and the set of noninferior solutions. This method has been applied to IEEE 30 bus system.

CONTENTS

(i) Acknowledgement

(ii) Abstract

CHAPTER 1 INTRODUCTION

1.1 Overview……..….1

1.2 Objectives and Methodology ……..….1

1.3 Literature Survey.……..…...2

1.3.1 Genetic Algorithm ……..2

1.3.2 Multiobjective Optimization ……...4

1.3.3 Economic Load Dispatch ……5

1.4 Plan of Thesis …….....8

CHAPTER 2 GENETIC ALGORITHM

2.1 Introduction …….…….9

2.1.1 General Structure of GA .....……9

2.2 Definitions & Concepts ……..……....10

2.2.1 Evolutionary algorithms …….……...11

2.3 GA approach …….....11

2.4 Theory of GAs …….14

2.5 General algorithm of GAs …….…….19

CHAPTER 3 MINIMIZATION OF ROSENBROCK FUNCTION MANUALLY USING GA

3.1 Introduction to Rosenbrock function…….……20

3.2 Solution performed manually using Genetic Algorithm…….…....22

3.3 Results ……30

3.4 Conclusion …….……31

CHAPTER 4 MULTIOBJECTIVE OPTIMIZATION

4.1 Introduction ……...…..…….32

4.2 Formulation of General Multiobjective Programming Problem..…..…….32

4.3 Noninferiority ……..…….……..33

4.3.1 Graphical Explanation of Noninferiority …….……..34

4.3.2 Mathematical Definition of Noninferiority …….……...34

4.4 Weighting Method ..……...……..36

4.5 Ideal Distance Minimization Method ……..……..37

CHAPTER 5 ECONOMIC LOAD DISPATCH IN 3D SPACE

5.1 Introduction ……...39

5.2 Load Dispatching ……..39

5.3 Economics of power generation of power plant ……40

5.4 Transmission losses ……...……42

5.4.1 Formulation of Economic Load Dispatch Problem ……..43

5.5 Environmental Pollution …….……...……44

5.6 Formulation of MOELD in 3D Space……...……..44

CHAPTER 6 RESULTS AND DISCUSSION

6.1 Introduction ……...46

6.2 2D Graphs ……49

6.3 3D Graphs ……51

6.4 Discussion …….....52

CHAPTER 7 CONCLUSIONS AND FUTURE SCOPE

7.1 Conclusions ……53

7.2 Scope of Future Work ……..……53

APPENDIX ..……....54

REFERENCES ...……63