CHAPTER 6

CONCLUSIONS

6.1 INTRODUCTION

A review of the significant results obtained in the course of the work and the scope for future research are highlighted in this chapter. Before reviewing the work done, the objectives of this investigation are recapitulated. The primary objective of this thesis is to develop more accurate and fast fuzzy evolutionary algorithms that can be applied to obtain the optimal solutions of multi-constrained dynamic economic dispatch, emission constrained economic dispatch, multi-area optimal power flow, multi-area security constrained optimal power flow and optimal power flow with multiple FACTS controllers.

6.2 REVIEW OF WORK DONE

This section presents the important conclusions of the investigations reported in the previous chapters. They are summarized below:

(i) A new formulation for the ED problem is developed considering all the practical constraints leading to an advanced economic dispatch with multiple objectives and constraints, effectively termed as multi-constrained dynamic economic dispatch problem. The proposed FMEP and FGTS methods are applied to solve the multi-constrained dynamic economic dispatch. The proposed methods are demonstrated to have
superior features, high quality solutions and stable convergence characteristics and their results are quite encouraging.

(ii) The proposed methods are used for solving the emission constrained economic dispatch problem. It is a multi-objective problem. But the present approach makes use of only one objective function and depending upon the problem such as economic, emission or combined economic and emission dispatch, only the coefficients of the objective function have to be changed. The effectiveness of the proposed algorithm has been tested on an Indian utility sample system. Investigations show that the proposed method is relatively simple, reliable, efficient and accurate.

(iii) The proposed FMEP and FGTS algorithms are extended for solving the MAED problem with security constraints. The performance of the proposed methods has been demonstrated with the IEEE 30-bus and IEEE 118-bus test systems. The convergence characteristic of the FMEP and FGTS methods is stable, avoids the premature convergence and takes less computational time than the EP and TS methods.

(iv) The multi-area optimal power flow problem is a large scale non-linear optimization problem with both linear and non-linear constraints. In order to verify the effectiveness of the proposed algorithms, first the DC model of the power system network is solved. The DCOPF problem is demonstrated by using single area, two area and four area systems. Finally, the proposed methods FMEP and FGTS are used for solving the multi-area ACOPF problem. The security constrained OPF for base case and contingency cases has been investigated on different IEEE systems and the results show that the proposed
methods are well suited for obtaining an optimal solution with less computation time.

(v) The optimal power flow with FACTS controllers is considered in the single area IEEE 30-bus system and interconnected two area systems. The optimal solutions obtained using EP, TS, FMEP and FGTS are compared and analyzed. The analysis reveals that the proposed algorithms are relatively simple, efficient and reliable. These algorithms can provide an accurate solution with fast convergence and have the potential to be applied to other power engineering problems.

6.3 SCOPE FOR FUTURE RESEARCH

The standard evolutionary programming and tabu search algorithm for the economic dispatch problem and optimal power flow has used Gaussian mutations to generate new offsprings. Using a variety of mutation operators, like Cauchy mutations, the potential of the algorithm can be investigated.

Co-ordination between various FACTS controllers pertaining to OPF with multiple FACTS controllers can be analyzed. For a higher degree of control, additional control variables corresponding to the modern FACTS controllers (SSSC, IPFC, generalized UPFC) and HVDC line can be implemented. The proposed algorithms can be extended to various optimization problems in a deregulated power system.

Hence the present approach and the results presented in this work will encourage further research in this field.

6.4 SUMMARY

The fuzzy evolutionary algorithms developed in this thesis will be extremely useful for electric power utilities, for enhancing the economy and security of operation in their systems.