CHAPTER 6
CONCLUSIONS AND SCOPE FOR FURTHER STUDY

6.1 Conclusions

The Optimal Power Flow (OPF) as discussed earlier is defined as a static nonlinear optimization problem to determine all of the adjustable variables. One important aspect of OPF is to determine the optimal settings of control variables for economic operation while satisfying various equality and inequality constraints.

In this research work, the optimal power flow model for IEEE 30 bus system is developed and analyzed using Matlab. And the performance of PSO based optimal power for the IEEE 30 bus system is analyzed for the aspect of voltage stability with the objective of bringing in minimum cost function. PSO results in Best Cost (F Value) in the range of 7.8189e+06 and TL value of 3.1048e+03 with a process of 50 iterations.

BAT algorithm in OPF is also analyzed for the IEEE 30 bus system. It reduces around 3% of Best Cost (F Value), and TL value compared to PSO controller. At the same time, it increases iterations around 6% compared to PSO controller. Hence, to control the iterations the GA method is proposed for OPF.

GA reduces around 12% of Best Cost (F Value) compared to PSO controller. 13% of TL value and 40% of iterations are reduced compared to PSO controller with the help of GA in OPF. Hence GA results in minimum Best Cost and TL value with less number of iterations compared to PSO and BAT in OPF. Therefore OPF using GA is optimum for IEEE 30 bus system.
Furthermore, in this research work, FACTS device of UPFC for controlling the power flow and enhancing system stability is included. The voltage controller in shunt control plays a major role in controlling the voltage and the reactive power injected by UPFC. PI and simulated annealing (SA) methods are applied and the performances were compared in UPFC in aspects of Maintained voltage and Harmonics reduction. PI controller lags to maintain voltage around 5% whereas SA eliminates drop in voltage. In aspects of Harmonics reduction, the PI controller reduces harmonics around 85% whereas SA reduces harmonics around 95%. Hence in both aspects such as Maintained voltage and Harmonics, reduced SA produces better results in UPFC. Therefore SA based UPFC is suitable for IEEE 30 bus system.

6.2 Scope for Further Study

In this study, optimal power flow for voltage control using various controllers such as PSO, BAT and GA are discussed. Comparative analysis validates the effectiveness of GA in OPF. Voltage control of power system is extended to utilisation of UPFC. Significance of DC link voltage control in UPFC in the aspect of voltage stability is discussed with the new algorithm of SA and compared with PI based UPFC. All above said analysis are studied in IEEE 30 bus system. The application of this system can be extended to higher IEEE bus systems for voltage stability and reactive power control.