7.1 Summary and Conclusions

In this chapter the significant results obtained during the course of this work are presented and a few suggestions for future research in the area of electrical power distribution systems, are presented.

In **Chapter 2**, a simple load flow technique for solving radial distribution networks has been presented. The advantage of the proposed method is required simple algebraic equation for receiving end voltage. An algorithm, which completely exploits the radial feature of the distribution networks, is developed. An algorithm for identifying the nodes beyond all the branches has also been developed, which helps to find out the node voltages, and after that branch currents have been computed from simple relationship of sending - end voltage, receiving -end voltage, load power.

In **Chapter 3**, a new method has been proposed for selecting the optimal branch conductor of radial distribution feeders based on a load flow technique. The proposed method selects the optimal branch conductor by minimizing an objective function. The main advantages of the proposed method are that it can keep the minimum voltage within prescribed limits and the current flowing through each branch is less than the maximum corresponding current carrying capacity of the branch conductor. The proposed method is very simple and its effectiveness has been demonstrated through two practical examples.

In **Chapter 4**, a simple method of minimizing the losses associated with the reactive component of branch currents by placing capacitors in a radial distribution system has been presented. This method first finds a sequence of buses to be compensated through finding the maximum net annual saving by a singly located capacitor. The optimal size of multiple capacitors is then determined by minimizing the losses with respect to the capacitor currents. This involves the solution of a set of linear algebraic equations.

In **Chapter 5**, a practical feeder reconfiguration method for loss reduction of radial distribution system is presented. From the studies, the following important observations can be concluded:

i) The power losses of distribution systems can be effectively reduced by proper feeder reconfiguration.
ii) In addition to power-loss reduction, the voltage profile can be improved by the proposed method.
iii) The effectiveness of the proposed method is tested with and without end node fixed shunt capacitors and the results are presented.

In **Chapter 6**, the distribution system-planning problem has been explored. The planning problem has been divided into three sub problems:

(1) Radial feeder planning problem,
(2) Selection of optimum type of branch conductor,
(3) Selection of tie lines for open loop design of distribution systems.

A simple procedure has been suggested for obtaining the optimal radial feeder path by satisfying all the constraints. After obtaining the optimal radial feeder path, optimum type of branch conductors have been selected using a branch conductor optimization algorithm based on forecasted load.

For the purpose of network reconfiguration under normal operating conditions, the feeder network has been planned as open loop structure. For obtaining open loop design of distribution systems, final choice of tie lines has been selected based on network reconfiguration algorithm.

7.2 Scope for Future Work

As a result of extensive investigations carried out in this work in the area of electric power distribution systems, the following suggestions for future research seem to be worth pursuing.

Load flow technique developed in this thesis is only for constant power load model for radial networks with balanced loads. In addition to this, it can be extended for other load models such as constant current, constant impedance and composite loads. The extension of this method for unbalanced loads and for meshed networks requires further investigation.

Network reconfiguration algorithm has been developed for balanced loads only. The application of this algorithm for unbalanced loads for loss reduction and load balancing requires further investigation.

The proposed algorithm for capacitor placement and network reconfiguration for radial distribution networks can also be applied to voltage stability analysis for radial distribution networks and aspects of voltage stability can be investigated.