**ENHANCEMENT OF DISTRIBUTION SYSTEMS PERFORMANCE USING MODERN OPTIMIZATION TECHNIQUES**

**B. Sc. Project**

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Project team

##### ABSTRACT

The major loads are connected to the network through the distribution systems. Therefore, the quality of the service is based on the continuity of power and maintaining the supply voltage within certain limits with specified frequency. Due to the rapid spread in the loads, the long distance of radial structure and the high R/X ratio of lines, the power loss reduction and voltage profile improvement are the challenge. To solve these problems, the distributed generations (DGs) and shunt capacitors are installed on the radial feeders for active and reactive power injections. Therefore, the optimal locations and sizes of DGs and capacitors in distribution systems can be formulated as a constrained optimization problem. In order to solve this problem, the optimization techniques are applied.

This project presents a procedure to determine the optimal placement of DGs and capacitors with an objective of power loss minimization or total voltage deviation minimization. The Archimedes Optimization Algorithm (AOA) is introduced to find the optimal locations and sizes of DGS and Capacitors considering the minimization of total power loss or TVD as objective function, while the security and operational constraints are fully achieved. The backward/forward sweep (BFS) algorithm is introduced for the load flow calculations. The proposed procedure is applied on 34-bus standard radial distribution system and East Delta Network (EDN) distribution system as a part of the Unified Egyptian Network (UEN) in order to solve the optimal DGs and capacitors placement problem. The obtained results are compared with other methods. Simulation results show the capability of the proposed procedure to find the optimal solution for significant minimization in the objective function with more accuracy and efficiency.

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* the proposed procedure represents a potential tool to improve the distribution system performance as well as help the system operators.

References

Appendix A

Fig. B.1 Flow chart of backward/forward sweep load flow