ABSTRACT

In this dissertation, an attempt has been made to study some aspects of facility location problems like (i) developing new mathematical models, (ii) developing efficient algorithms for solution of these models or for some existing models and (iii) comparing the various algorithms, existing or proposed, for a model. Specifically, this thesis studies the following eight problems pertaining to general problem of facility location in continuous space.

First, an attempt has been made to approximate the rural road distance with mathematical functions taking two samples of data, one each from plain area and, relatively rocky and hilly area of Eastern India. Five distance norms have been assumed and their approximation power has been tested with four different performance measures.

Second, this thesis proposes an iterative scheme to solve facility location problems with generalized euclidean distance norm and compares various available and proposed algorithms for solving both single and multiple facility unconstrained location problems.

Third, this study deals with some aspects of constrained facility location problem. Specifically it

proposes the use of a commercially available nonlinear programming package, MINOS to solve multiple facility location problem when each new facility is restricted to be located within a specified polygon and compares it with other available methods. When all the new facilities are restricted to be located within either a circular or an elliptic region, this thesis suggests the use of a generalized lagrange multiplier technique to get optimal solution. Further to this study on constrained location, the thesis extends the single facility location model in the presence of circular forbidden region to the location elliptic forbidden region.

Fourth , this dissertation deals with some aspects of 'round-trip location' problem. To be specific, this study first proposed the use of an efficient nonlinear programming package, MINOS/GRG to solve non-rectilinear distance norm 'round-trip location' problem and studied the effect of distance norm on the optimal location. This also made some stochastic extensions of the usual 'round-trip location' problem and showed that these extended models are equally suitable for MINOS/GRG solution.

Fifth, this thesis is its study on minimax location problem (i) proposed three alternate methods of solution and compared them with the existing methods, and (ii) made some stochastic extensions of the usual minimax location problem.

Sixth, this dissertation in its study on the mixed norm facility location problem attempts (i) to use MINOS/GRG for the solution of single facility location problem with mixed norms and to compare with existing methods, (ii) to use a Weiszfeld's approximation for multi-facility location and to study the effect of Weiszfeld's approximation constant ϵ on the optimal solution and CPU time, and finally (iii) to use MINOS/GRG to solve minimax location problem with mixed norms and to compare with the best available method.

Seventh, in an attempt to study some aspects of facility location problem with multiple criteria, this presents a linear compromise solution scheme and compares it with the other available models.

Eighth, this thesis in its study on some aspects of 'transportation-location problem' first attempted to know the effect of distance norm on the optimal location and transportation schedule. Then it generalized the usual transportation-location problem to incorporate other aspects of public distribution system like procurement, processing, warehousing and distribution and developed heuristic algorithms to solve this and one of its special case.