CHAPTER 9

CONCLUSION

New methods for solving large scale sum of ratios linear fractional programming problems, multi objective linear programming problems are presented in this research work. The following algorithms are developed:

i) Iterative algorithm to solve sum of ratios linear fractional programming problems with arbitrary number of ratios in its objective function.

ii) Iterative algorithm to solve multi objective linear programming problems with arbitrary number of objective functions.

iii) Genetic algorithm to solve large scale multi objective linear programming problems.

The sum of ratios linear fractional programming algorithm solves linear fractional programming problems in which the objective is a sum of fractional functions. Large scale problems with several fractions, decision variables and constraints are solved with the help of this algorithm. Computational efforts are very much reduced by avoiding unnecessary popping in and out of decision variables to and from the basis.

Multi objective linear fractional programming algorithm solves multi objective linear programming problems by transforming the given objective functions into a sum of ratios of objectives. In this sense, the multi objective
linear programming problem is approached in a new pattern. Problem is solved for all orderings of given objective functions. Optimal solution is found by the algorithm in one of the orderings. Large scale multi objective linear programming problems are solved with the help of this algorithm.

A new genetic algorithm solves multi objective linear programming problems by transforming the given objective functions into a sum of ratios of objectives. Parents are created with random numbers within the bounds of the decision variables selected from the θ matrix. The fitness function is formed as sum of ratios of given objective functions. Genetic operators such as selection, crossover and mutation operators are applied for chosen number of generations and feasible solutions are found. The process is repeated for all the orderings of the given objective functions. The ordering that produces the best value for fitness function is reported as the optimal solution.

Software packages are developed in C language and Visual C++ to implement all the three algorithms. Large Scale problems with decision variables upto 1000 and constraints upto 250 are solved with the help of the developed packages.

Computational efficiency of the algorithms is established in terms of multiply/divide operations involved. Formulae for counting the number of multiply/divide operation is evolved for worst case requirement. It is found that the number of multiply/divide operations in the proposed algorithms are much lesser than the worst case solution. Execution time is also measured for each problem. The results are plotted.
Future research can be carried in the directions suggested below:

i) The procedure developed for sum of ratios linear fractional programming problems can be extended to non-linear and integer programming problems.

ii) The procedure developed for multi objective linear programming problems can be extended to non-linear programming problems.

iii) The methods suggested can be suitably modified to solve bounded variable problems whose constraint coefficients are unrestricted in sign.

iv) For large scale problems sparsity of constraint matrix is one other factor which can drastically reduce the number of multiply/divide operations. If one can modify the algorithm in such a way that it stores only the non-zero elements of the constraint matrix, the computational efficiency will increase and storage requirement will decrease.