Abstract

Multi-Choice Programming (MCP) problem is a Mathematical Programming (MP) problem, in which decision maker is allowed to set multiple number of choices for a parameter. There is no direct methodology to solve MCPs. Even a medium size linear programming problem involving multi-choice parameter is computationally expensive to obtain an optimal solution. Therefore, to develop a methodology that optimizes objective function and selects an appropriate multi-choice parameter, is one of the challenging problem in MCP. Keeping this in mind the core of the thesis is concentrated in building up solution procedures for MCP that can be implemented also to probabilistic and fuzzy programming problems involving multi-choice type parameters.

Several parameters, namely cost coefficients, technical coefficients, resource limits may be taken into consideration, when formulating an MP problem. The thesis highlights the formulation of MCP considering the resource limits as multi-choice type parameters. It covers a detailed description of transformation techniques with the help of binary variables in order to solve a Multi-Choice Linear Programming (MCLP) problem. It also describes the application of some numerical methods, namely interpolating polynomial methods for multi-choice parameters with the intention of avoiding the difficulties that are faced during use of binary variables for transformation of MCLP to an equivalent MP problem. Both transformation techniques are implemented for single objective MCP and multi-objective MCP

problems.

The transformation techniques are implemented for single objective and multi-objective probabilistic programming problems, where the right hand side parameters are multi-choice type and rest of the parameters are normally distributed independent random variables with known mean and variance in the probabilistic constraints. Fuzzy MCLP problem, where some of the parameters and decision variables are trapezoidal type fuzzy numbers, is evaluated by using the multi-choice programming methods.

In multi-choice programming environment, we formulate a multi-choice and multi-objective linear programming model for solving an integrated production planning problem for a steel plant. Then the MP model is solved by using MCP methods. Computations of the MP model has been performed with the real production data to find the efficiency of the methodology.

Keywords: Fuzzy Programming, Goal Programming, Integrated Production Planning, Multi-Objective Programming, Multi-Choice Programming, Stochastic Programming.