PREFACE

The present thesis is an outcome of the research work done by the author under the exemplary supervision, inspiring guidance and invaluable proficiency of Dr. (Mrs.) Surjeet Kaur Suneja, Department of Mathematics, Miranda House, University of Delhi. The thesis is devoted to the study of optimality conditions and duality results for vector optimization problems.

The thesis is divided into four chapters, which are further divided into sections. Items such as definitions, examples, theorems and remarks are numbered consecutively within each section and the inequalities are numbered consecutively within each chapter. The thesis ends with an extensive bibliography.

The first chapter is introductory and is divided into two sections. The first section presents briefly various fundamental concepts related to optimization problems and the second section summarizes the work presented in the thesis.

In the second chapter we talk about some generalizations of cone convex functions and prove optimality conditions and duality results for vector optimization problems. This chapter is divided into four sections. In the first section the concept of cone semistrictly convex functions on topological vector spaces are introduced and their properties and interrelations with cone convex functions are studied. In the second section assuming the functions to be cone subconvex, sufficient optimality conditions are proved for a vector valued minimization problem over topological vector spaces, involving Gâteaux derivatives. A Mond-Weir type dual is associated with the primal problem and weak and strong duality results are established. In the third section we
introduce cone semilocally preinvex and related functions. Necessary and sufficient optimality conditions and duality results are established for the vector optimization problem with equality and inequality constraints over cones. The fourth section introduces generalized type-I, generalized quasi type-I, generalized pseudo type-I, generalized quasi pseudo type-I and generalized pseudo quasi type-I functions over cones, for a nonsmooth vector optimization problem. Various optimality and duality results are proved under cone generalized type-I assumptions using Clarke’s generalized gradients of locally Lipschitz functions.

The third chapter is about second order symmetric duality in vector optimization and is divided into two sections. In the first section pairs of second order Wolfe type and Mond-Weir type symmetric duals are formulated. Various duality results are established for these multiobjective non linear programming problems involving second order \((F, \rho)\) convex and second order \((F, \rho)\) pseudoconvex functions. The second section considers a pair of Mond-Weir type second order symmetric dual programs over arbitrary cones and discusses duality results using second order cone pseudoconvex and second order strongly cone pseudoconvex functions.

In the fourth chapter we talk about higher order optimality and duality results. It is divided into two sections. In the first section a new class of higher order \((F, \rho, \sigma)\)-type I functions for a multiobjective programming problem is introduced. Higher order Mond-Weir and Schaible type dual programs are formulated for a nondifferentiable multiobjective fractional programming problem where the objective functions and the constraints contain support functions of compact convex sets in \(\mathbb{R}^n\) and weak and strong duality results are studied. The second section defines higher order cone convex, higher order cone pseudoconvex, higher order strongly cone pseudoconvex, and higher order cone quasiconvex functions. Higher
order sufficient optimality conditions and higher order duality results are established under higher order cone convexity assumptions.

The papers/books mentioned in the thesis for reference are given at the end and the numbers in the bracket [ ] refer to these references. There are a few papers in the list of references which are not available and have been noted for record only. The subject matter of the thesis is based on my work in the following research papers.


