



PROCEEDING BOOK

**6TH INTERNATIONAL CONFERENCE ON RECENT
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ICRAPAM 2019 / JUNE 12-15 2019**

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JUNE 12-15, 2019**

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PREFACE

International Conference on Recent Advances in Pure and Applied Mathematics (ICRAPAM 2019) was held in Istanbul, Turkey, at the Istanbul Medeniyet University, from June 12 to 15, 2019. It was the sixth edition of such conferences. The chairman of the Organizing Committee of ICRAPAM 2019 was Professor Ekrem Savas, and the Scientific Committee consisted of mathematicians from 16 countries. 200 participants from 20 countries attended the conference and 100 papers have been presented, including 6 plenary lectures and 15 presentations in Poster Session. The conference was devoted to almost all fields of mathematics and variety of its applications. The organizers gratefully acknowledge a partial financial support by Istanbul Medeniyet University. This issue of the proceeding contains 12 papers presented at the conference and selected by the usual editorial procedure of scientific committee. We would like to express our gratitude to the authors of articles published in this issue and to the referees for their kind assistance and help in evaluation of contributions. I would like to thank to the following my colleagues and students who helped us at every stage of International Conference on Recent Advances in Pure and Applied Mathematics (ICRAPAM 2019).

Editor:

Ekrem SAVAS

Usak University, Usak – Turkey

AIM OF THE CONFERENCE

International Conference on Recent Advances in Pure and Applied Mathematics (ICRAPAM 2019) is aimed to bring researchers and professionals to discuss recent developments in both theoretical and applied mathematics and to create a professional knowledge exchange platform between mathematicians. The conference is supported by The Turkish Cooperation and Coordination Agency (TIKA) and Istanbul Medeniyet University.

SCOPUS

Prospective authors are invited to submit their one-page abstracts on the related, but not limited, following topics of interest:

Numerical Analysis, Ordinary and Partial Differential Equations, Scientific computing, Boundary Value Problems, Approximation Theory, Sequence Spaces and Summability, Real Analysis, Functional Analysis, Fixed Point Theory, Optimization, Geometry, Computational Geometry, Differential Geometry, Applied Algebra, Combinatorics, Complex Analysis, Flow Dynamics, Control, Mathematical modelling in scientific disciplines, Computing Theory, Numerical and Semi-Numerical Algorithms, Game Theory, Operations Research, Optimization Techniques, Fuzzy sequence spaces, Symbolic Computation, Fractals and Bifurcations, Analysis and design tools, Cryptography, Number Theory and Mathematics Education, Finance Mathematics, Fractional Dynamics, Fuzzy systems and fuzzy control, Dynamical systems and chaos, Biomathematics & modeling. Soft Computing, Cryptology & Security Analysis, Image Processing, etc.

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The full texts contained in this proceeding book contain all oral presentations in ICRAPAM 2019 Conference.

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Two Parametric Kinds of Apostol Type Numbers and Polynomials Related to Eisenstein Series and Dedekind Sums

Prof. Dr. Gradimir Milovanovic (Serbian Academy of Sciences and Arts)



Methods for Numerical Construction of s-Orthogonal Polynomials

Prof. Dr. Mujahid Abbas (Department of Mathematics, GCU-54000 Lahore Pakistan)



A Discussion on Attractive Points of Further Generalized Mappings

Prof. Dr. Zakia Hammouch (Université Moulay Ismail Morocco)



λ - Statistical Convergence in Intuitionistic Fuzzy 2- Normed Space

Prof. Dr. Ayman Badawi (American University of Sharjah)



Recent Results on Absorbing Ideals of Commutative Rings

Prof. Dr. Mohammad Mursaleen (Aligarh Muslim University)



Solvability of Infinite System of a Class of Boundary Value Problems

Prof. Dr. Abdelmejid BAYAD (Paris-Saclay University, France)



Indices in Cubic Number Fields and Thue Equations

Prof. Dr. Ljubisa D R Kočinac (University of Niš)



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E-duality results for *E*-differentiable vector optimization problems under (generalized) *E*-convexity

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Keywords

E-differentiable function
E-convex function
Mond-Weir *E*-duality
Wolfe *E*-duality
Mixed *E*-duality

Abstract: In this paper, a class of *E*-differentiable multiobjective programming problems with both inequality and equality constraints is considered. The so-called vector mixed *E*-dual problem is defined for the considered *E*-differentiable multiobjective programming problem with both inequality and equality constraints. Then, several mixed *E*-duality theorems are established under (generalized) *E*-convexity hypotheses. Further, so-called vector Mond-Weir *E*-dual and vector Wolfe *E*-dual problems are also defined for the considered *E*-differentiable multiobjective programming problem as special cases of its vector mixed *E*-dual problem.

1. Introduction

Several classes of functions have been defined for the purpose of weakening the limitations of convexity in mathematical programming. One of the notions of generalized convexity introduced into optimization theory is the concept of *E*-convexity. The definitions of *E*-convex set and *E*-convex function were introduced by Youness [15]. This kind of generalized convexity is based on the effect of an operator $E : R^n \rightarrow R^n$ on the sets and the domains of functions. However, some results and proofs presented by Youness [15] were incorrect as it was pointed out by Yang [14]. Megahed et al. [11] presented the concept of an *E*-differentiable convex function which transforms a (not necessarily) differentiable convex function to a differentiable function based on the effect of an operator $E : R^n \rightarrow R^n$. Recently, Antczak and Abdulaleem [1] proved the so-called *E*-optimality conditions and Wolfe *E*-duality for *E*-differentiable vector optimization problems with both inequality and equality constraints. In recent years, duality in vector optimization has been attracting the interest of many types of research. Such optimization problems with several objectives conflicting with one another reflect the complexity of the real world and are encountered in various fields. Many authors have defined the duality results for various classes of nonconvex vector optimization problems (see, for example, [1–9], and others). In this paper, a class of nonconvex *E*-differentiable vector optimization problems with both inequality and equality constraints is considered in which the involved functions are (generalized) *E*-convex. For such a (not necessarily) differentiable multiobjective programming problem, its vector mixed *E*-dual problem is defined. Further, so-called vector Mond-Weir *E*-dual and vector Wolfe *E*-dual problems are also defined for the considered *E*-differentiable multiobjective programming problem as special cases of its vector mixed *E*-dual problem. Then, several *E*-duality theorem are established between the considered *E*-differentiable multicriteria optimization problem and its vector *E*-duals under appropriate (generalized) *E*-convexity hypotheses.

2. Preliminaries

Let R^n be the n -dimensional Euclidean space and R_+^n be its nonnegative orthant. The following convention for equalities and inequalities will be used in the paper. For any vectors $x = (x_1, x_2, \dots, x_n)^T$ and $y = (y_1, y_2, \dots, y_n)^T$ in R^n , we define:

- (i) $x = y$ if and only if $x_i = y_i$ for all $i = 1, 2, \dots, n$;
- (ii) $x > y$ if and only if $x_i > y_i$ for all $i = 1, 2, \dots, n$;
- (iii) $x \geq y$ if and only if $x_i \geq y_i$ for all $i = 1, 2, \dots, n$;
- (iv) $x \geq y$ if and only if $x_i \geq y_i$ for all $i = 1, 2, \dots, n$ but $x \neq y$;

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