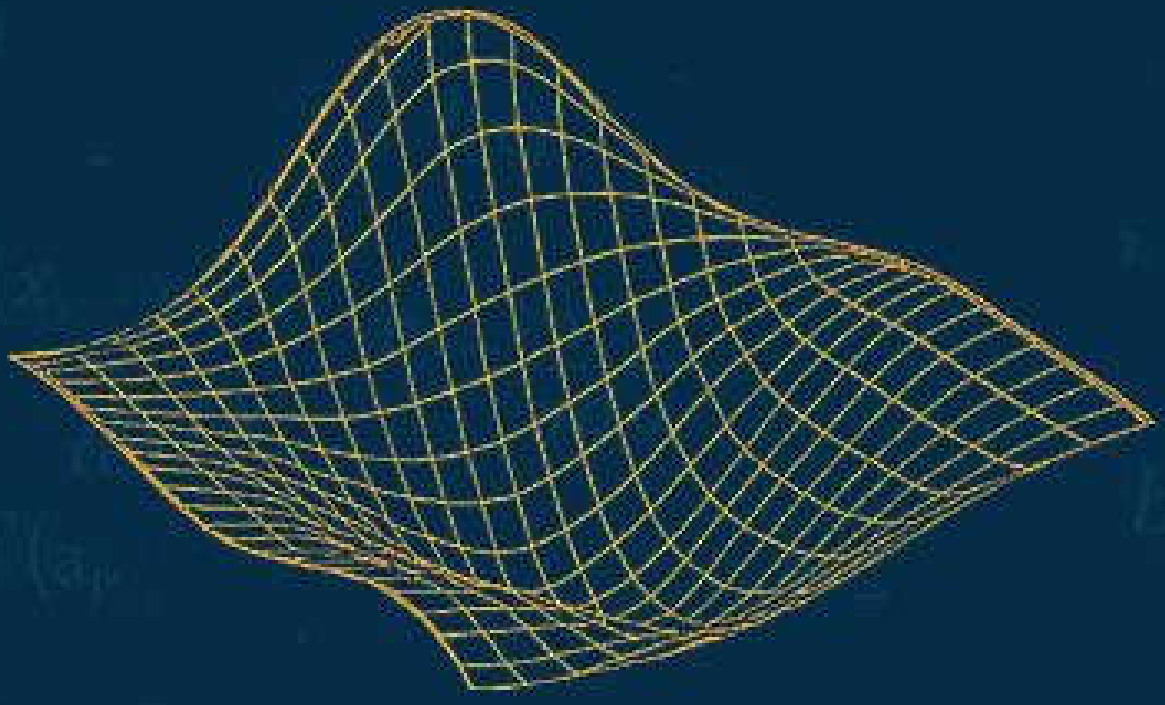
ADVANCED STUDIES IN MATHEMATICS AND STATISTICS

VOLUME-1



EDITOR
MOBIN AHMAD

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Preface

The field of mathematics and statistics continues to evolve, bridging theoretical advancements with practical applications across diverse disciplines. *Advanced Studies in Mathematics and Statistics-I Volume – 1* is a comprehensive volume that brings together cutting-edge research and foundational concepts in these fields, offering a rich resource for researchers, graduate students, and professionals seeking to deepen their understanding of advanced mathematical and statistical methodologies.

This book encompasses a broad spectrum of topics, carefully curated to reflect the dynamic interplay between pure and applied mathematics, as well as statistical theory. The chapters cover a range of subjects, from numerical methods for solving non-linear equations to the intricacies of graph theory, ring theory, and fuzzy optimization. Each chapter is designed to provide both theoretical rigor and practical insights, making the content accessible to those with a strong mathematical foundation while also serving as a reference for specialized research.

The book begins with an exploration of numerical solutions to non-linear equations, presenting classical and fast-convergent methods such as Newton's, Steffensen's, and Halley's approaches. These foundational techniques set the stage for subsequent discussions on optimization, including goal programming and fuzzy optimization models for production planning in uncertain environments. The inclusion of graph theory and fixed-point theory in metric spaces highlights the structural elegance of mathematics, while topics like ring theory, approximation theory, and hypersurfaces in metallic Riemannian manifolds delve into abstract and geometric frameworks.

Statistical methodologies are equally prominent, with a dedicated chapter on the fundamentals of statistics, complemented by advanced discussions on error analysis in interpolation methods and eigen value localization for quaternionic matrices. The book also addresses interdisciplinary applications, such as the study of magnetic field effects on rotating magneto-hydrodynamic (MHD) flows and hypergeometric transformations, which underscore the relevance of mathematics in physical and engineering contexts.

Our aim is to provide a cohesive yet diverse collection of topics that inspire further exploration and research. Each chapter is authored by experts in their respective fields, ensuring depth and clarity. Whether you are a mathematician, statistician, or practitioner in a related discipline, this book offers valuable insights into the theoretical underpinnings and practical applications of advanced mathematics and statistics.

We hope that *Advanced Studies in Mathematics and Statistics-I Volume-1* serves as a catalyst for intellectual curiosity and fosters a deeper appreciation for the beauty and utility of these disciplines. We invite readers to engage with the material, explore its applications, and contribute to the ongoing advancement of mathematical and statistical sciences.

Editor
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GOAL PROGRAMMING

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Goal Programming (GP) is the most widely and suitable technique for solving multi-objective linear problems. In searching for the origin of the goal programming analysis some analysts start with G.B. Dantzig's (1947) iterative procedure used in the analysis. While this start may be appropriate, it does not focus clearly on the specific nature of what is known today as goal programming. The ideas of goal programming were originally introduced by Charnes in (1955) for solving Mult objective linear programming problems. It was not until 1961 that the name "goal programming " was attached to analytical process that solves MOLPs.

One of the most significant contributions that stimulated interest in the applications of GP was due to A. Charnes and W.W. Cooper in 1961. They introduced the concept of goal programming in connection with unsolvable linear programming problems (LPP). Additionally, they pointed out the issue of goal attainment and the value of goal programming in allowing for goals to be flexibility included in the model formulation. Another contribution during 1960s that had a significant impact on the formulation of the goal programming models and their application was contained in a text written by Y. Ijiri in 1965. Ijiri further developed the goal programming analysis based on the foundation laid by Charnes and Cooper. He explained the use of "preemptive priority factors " to treat multiple conflicting objectives in accordance with their importance in the objective function. Ijiri also suggested the "generalized inverse approach" and doing so, established goal programming as a distinct mathematical programming