## **CONTENTS**

Preface ix
CHAPTER 1. INTRODUCTION 3
<ul> <li>1.1 Historical Perspective of Mathematical Programming 3</li> <li>1.2 Examples of Programming Problems 4</li> <li>1.3 Plan of Book 6</li> </ul>
CHAPTER 2. LINEAR PROGRAMMING 8
2.1 Introduction 8 2.2 Linear Programming Models 9 2.3 Geometric Interpretation 17 2.4 An Illustration of the Simplex Method 20 2.5 Theoretical Derivation of the Simplex Method 29 2.6 Pseudo-Objective Function 45 2.7 Associated Dual Problem 46 2.8 Selecting the "Best" Nonbasic Variables 48 2.9 Redundant Nonbasic Variables 51 2.10 Degeneracy and Cycling 55
CHAPTER 3. FURTHER COMPUTATIONAL ALGORITHMS AND TOPICS IN LINEAR PROGRAMMING 62
3.1 Revised Simplex Algorithm 63 3.2 Solutions of Similar Problems 71 3.3 Sensitivity Analysis 76 3.4 Parametric Programming 85 3.5 Bounded Variable Algorithm 90
CHAPTER 4. LINEAR DUALITY THEORY 103
4.1 Linear Duality Theory 103 4.2 Alternative Proof of Linear Duality 118 4.3 Primal-Dual Algorithm 121 4.4 Economic Interpretation of Duality 126 4.5 Extensions of Linear Duality 127

CHAPTER	5. TOPICS IN LINEAR PROGRAMMING AND STATISTICS 133
5.1	Linear Programming Techniques in Regression Analysis 133
5.2	Properties of $L_1$ Estimators 136
5.3	Unbiased $L_p$ Regression Estimators 149
	Computational Algorithms 153
5.5	Simplex-Based Algorithms 159
	Median-Polish and L <sub>1</sub> Estimators 170 Chance-Constrained Programming 176
CHAPTER	6. THE TRANSPORTATION PROBLEM 194
6.1	Obtaining a Feasible Solution 196
	Transportation Algorithm 203
	An Improved Approximation Method 206
	Transportation Problems with Simple Upper Bounds 208
6.5	Statistical Application 212
	7
CHAPTER	7. THE ASSIGNMENT PROBLEM 223
7.1	Solution by Enumeration 224
	Computational Procedure 225
7.3	Summary of Procedure 229
CHAPTER	8. GOAL PROGRAMMING 233
8.1	Advantages of Goal Programming 233
	General Goal Programming Model 234
8.3	Ranking of Goals 236
	Preemptive Ordering 236
	Archimedean Ordering 237
	Simplex Method of Goal Programming 237
8.7	Goal Programming Solution via MPSX/370E 243
APPENDI	X A. LINEAR PROGRAMMING COMPUTATIONS WITH THE MPSX/MPS-III SYSTEM 251
A.1	Data Format 251
	Organization of Input 252
A.3	Sample Problem (blending problem) 255
A.4	Control Program 258
	Additional Commands 260
	Computer Output 263
	Parametric Programming 266
A.8	Range Output 268

APPENDIX **B.** CONVEX CONES 272

INDEX 277