Contents

Preface

PART 1 ELEMENTARY LINEAR PROGRAMMING

| Introduction to Linear Programming | 3 |
|---|--|
| A definition of mathematical programming | 3 |
| A distribution problem | 4 |
| A mathematical formulation | 7 |
| Introduction to the Simplex Method | 11 |
| A blending problem | 11 |
| Some properties of the simplex method | 16 |
| The Simplex Method—Further Details | 20 |
| Algebraic summary | 20 |
| Basic method of finding a first feasible solution | 22 |
| Practical method of finding a first feasible solution | 28 |
| Transportation Problems | 32 |
| A definition of a transportation problem | 32 |
| | 33 |
| The solution of transportation problems | 36 |
| Duality and the Dual Simplex Method | 43 |
| | 43 |
| The dual simplex method | 46 |
| Parametric Programming | 50 |
| | 50 |
| Parametric right hand side | 53 |
| The Inverse Matrix Method | 61 |
| Outline of the inverse matrix method | 61 |
| The steps of the inverse matrix method | 63 |
| | A mathematical formulation Introduction to the Simplex Method A blending problem Some properties of the simplex method The Simplex Method—Further Details Algebraic summary Basic method of finding a first feasible solution Practical method of finding a first feasible solution Transportation Problems A definition of a transportation problem The formulation of transportation problems The solution of transportation problems Duality and the Dual Simplex Method Duality The dual simplex method Parametric Programming Parametric objective function Parametric right hand side The Inverse Matrix Method Outline of the inverse matrix method |

| X | | Content |
|--------|---|----------|
| 3 | The product form of inverse | 64 |
| 4 | | 66 |
| 5 | A numerical example | 68 |
| | | |
| PA] | RT 2 ORGANIZATION OF LP CALCULATION | S |
| 8 | Formulation of Linear Programming Problems | 77 |
| 1 | | 77 |
| 2 | | 78 |
| 3 | | 80 |
| 4 5 | | 81 |
| 6 | 8 | 81 |
| 7 | | 86 86 |
| | <i>5</i> | οι |
| 9 | Input for Linear Programming Problems | 89 |
| 1 | | 89 |
| 2 | 1 Bentelle | 91 |
| 3 4 | | 94 |
| 5 | Polania namion | 95 |
| | T Powerton | 95 |
| 10 | Output from LP Calculations | 97 |
| 1 | Normal operating output | 97 |
| 2 | Other output | 99 |
| 11 | Post-optimal Analysis | 102 |
| 1 | Introduction | 102 |
| 2 | Standard facilities | 103 |
| 3 | Uses of post-optimal analyses | 104 |
| DAE | OT 2 SPECIAL PROCEDURES | |
| | RT 3 SPECIAL PROCEDURES | |
| 12 | Lagrange Multipliers and Kuhn-Tucker Conditions | 109 |
| 1 | Theory of optimization | 109 |
| 2 | Conditions for quadratic optimization | 112 |
| 13 | Quadratic Programming | 114 |
| 1 | Introduction | 114 |
| 2 | The simplex method | 115 |
| 3 | Up-dating the tableau | 117 |
| 4 | A numerical example | 118 |
| 5 | The practical version of the method | 121 |

| Contents | | хi |
|---------------------------------------|---|------------|
| 14 | Separable Programming | 124 |
| 1 | Introduction | 124 |
| 2 | Product terms | 126 |
| 3 | Defining the ranges of the variables | 128 |
| 4 | Defining the grid | 129 |
| 5 | Interpolation | 129 |
| 6 | An example of separable programming formulation | 131 |
| 7 | Parametric separable programming | 134 |
| 8 | The limitations of separable programming | 134 |
| 15 | Integer Programming | 136 |
| 1 | Introduction | 136 |
| 2 | Applications of integer programming | 136 |
| 3 | Integer programming formulation of non-linear functions | 137 |
| 4 | Branch and bound methods for mixed integer program- | |
| | ming | 141 |
| 5 | Extensions to the branch and bound code | 145 |
| 6 | Martin's version of the method of integer forms | 145 |
| 7 | Partial enumeration methods | 148 |
| 8 | The choice between integer programming methods | 150 |
| 16 | Decomposition | 151 |
| 1 | What is decomposition? | 151 |
| 2 | The master problem | 152 |
| 3 | Sub-problems | 155 |
| 4 | Interpreting the final solution | 168 |
| 5 | Theoretical interest in decomposition | 168 |
| 6 | Computational experience | 169 |
| 7 | Problem formulation for decomposition | 170 |
| 8 | Conclusions | 172 |
| 17 | Stochastic Programming | 173 |
| 1 | Introduction | 173 |
| 2 | Non-sequential stochastic programming | 175 |
| 3 | Sequential stochastic programming | 177 |
| 4 | Chance-constrained programming | 180 |
| 5 | Models for uncertain market sizes | 180 |
| Appendix: Note on the LP/90/94 System | | |
| | .1 Introduction | 184 |
| | .2 I-tape data | 184 |
| | .3 Agendum cards | 186 |
| | _ | 189 |
| References | | |
| Tude | exes: Author | 193 194 |
| | Subject | * 7-7 |