

CONTENTS

1 EUCLIDIAN VECTOR SPACE: NORMS, QUADRATIC FORMS, SYMMETRIC DEFINITE SYSTEMS OF EQUATIONS 1

1-1	The Linear Vector Space; Matrices	1
1-2	Norms; Condition of a Matrix	7
1-3	Necessary and Sufficient Conditions for the Definiteness of a Quadratic Form	15
1-4	Symmetric Triangular Decomposition: Cholesky's Method	23

2 RELAXATION METHODS 38

2-1	Fundamentals in Relaxation Calculations	38
2-2	The Successive Displacement Method	42
2-3	Gradient Methods	63
2-4	The Method of Conjugate Gradients	68

3 DATA FITTING 76

3-1	Formulation of the Problem	76
3-2	Unconstrained Fitting	81
3-3	Constrained Fitting	86
3-4	The Method of Orthogonalization in Data Fitting	92
3-5	The Method of Conjugate Gradients in Data Fitting	103

4 SYMMETRIC EIGENVALUE PROBLEMS 111

4-1	Eigenvalue Problems of Physics	111
4-2	Criticism of the Characteristic Polynomial	114
4-3	The Principal Axis Theorem	117
4-4	Transformation to Diagonal Form: Simultaneous Computation of All Eigenvalues	121
4-5	Transformation to Tridiagonal Form: Sturm Sequences; Computation of Individual Eigenvalues	136

4-6	LR Transformation and QD Algorithm: Calculation of the Smallest Eigenvalues	158
4-7	Vector Iteration: Largest and Smallest Eigenvalues	187
4-8	The Generalized Symmetric Eigenvalue Problem	199
4-9	Résumé of Eigenvalue Methods	203

5 BOUNDARY VALUE PROBLEMS, RELAXATION 205

5-1	Boundary Value Problems	205
5-2	Operator Equations and Relaxation	221
5-3	The Eigenvalue Problem	248

**APPENDIX: Fortran Subroutine Counterparts
of Algol Procedures 251****BIBLIOGRAPHY 265****INDEX 271**

