

## CONTENTS

1. Quaternionic Analysis	11
1.1. Algebra of Real Quaternions	11
1.2. H-regular Functions	13
1.3. A Generalized LEIBNIZ Rule	23
1.4. BOREL-POMPEIU's Formula	26
1.5. Basic Statements of H-regular Functions	29
2. Operators	48
2.3. Properties of the T-Operator	48
2.4. VEKUA's Theorems	53
2.5. Some Integral Operators on the Manifold	56
3. Orthogonal Decomposition of the Space $L_{2,H}(G)$	64
4. Some Boundary Value Problems of DIRICHLET's Type	67
4.1. LAPLACE Equation	67
4.2. HELMHOLTZ Equation	76
4.3. Equations of Linear Elasticity	85
4.4. Time-independent MAXWELL Equations	91
4.5. STOKES Equations	87
4.6. NAVIER-STOKES Equations	106
4.7. Stream Problems with Free Convection	113
4.8. Approximation of STOKES Equations by Boundary Value Problems of Linear Elasticity	118
5. H-regular Boundary Collocation Methods	122
5.1. Complete Systems of H-regular Functions	122
5.2. Numerical Properties of H-complete Systems of H-regular Functions	129
5.3. Foundation of a Collocation Method with H-regular Functions for Several Elliptic Boundary Value Problems	138
5.4. Numerical Examples	146
6. Discrete Quaternionic Function Theory	153
6.1. Fundamental Solutions of the Discrete Laplacian	153
6.2. Fundamental Solutions of a Discrete Generalized CAUCHY-RIEMANN Operator	164
6.3. Elements of a Discrete Quaternionic Function Theory	175
6.4. Main Properties of Discrete Operators	188
6.5. Numerical Solution of Boundary Value Problems of NAVIER-STOKES Equations	187
6.6. Concluding Remarks	208
Appendix	210
References	241
Subject Index	251
Notations	253