

Contents

Preface — VII

Introduction — 1

- 1 Optimal Distributed Control Problem for an Ill-Posed Strongly Nonlinear Elliptic Equation with p -Laplace Operator and L^1 -Type of Nonlinearity — 11**
 - 1.1 Auxiliaries and previous analysis of the boundary value problem — 12
 - 1.2 On Pohozaev inequality and a priori estimates for a special class of weak solutions — 16
 - 1.3 On reformulation of the original optimal control problem — 25
 - 1.4 Auxiliary fictitious optimal control problem and its properties — 27
 - 1.5 On a priori estimate for the solutions of variational problem (1.59) — 29
 - 1.6 On asymptotic behaviour of the sequence of optimal pairs to the problem (1.47)–(1.50) as $\epsilon \rightarrow 0$ — 34
- 2 On Approximation of One Class of Optimal Control Problems for Strongly Nonlinear Elliptic Equations with p -Laplace Operator — 39**
 - 2.1 On consistency of optimal control problem — 40
 - 2.2 Approximating optimal control problems and their previous analysis — 44
 - 2.3 Asymptotic analysis of approximating OCP — 54
 - 2.4 Optimality conditions for approximating OCP — 67
- 3 Neumann Boundary Optimal Control Problem for Strongly Nonlinear Elliptic Equation with p -Laplace Operator — 73**
 - 3.1 Setting of the problem — 74
 - 3.2 A priori estimates both for energy solutions and feasible solutions — 80
 - 3.3 Existence of optimal boundary controls — 96
 - 3.4 On approximation of optimal boundary control problem — 98
 - 3.5 On existence of bounded feasible solutions — 108
- 4 Asymptotic Analysis of Optimal Neumann Boundary Control Problem in Domain with Boundary Oscillation for Elliptic Equation with Exponential Non-Linearity — 116**
 - 4.1 Previous analysis of optimal control problem — 118
 - 4.2 On consistency of optimal control problem — 129
 - 4.3 On uniqueness of optimal solution and optimality conditions — 133
 - 4.4 Description of the domain perturbations — 141
 - 4.5 Asymptotic analysis of OCP (4.1)–(4.5) — 147

5	On Optimal and Quasi-Optimal Controls in Coefficients for Multi-Dimensional Thermistor Problem with Mixed Dirichlet-Neumann Boundary Conditions — 164
5.1	Introduction and main motivation — 164
5.1.1	Relaxation of the original OCP — 170
5.1.2	Motivation — 172
5.1.3	Main results — 173
5.2	Preliminaries and some auxiliary results — 174
5.2.1	On Orlicz spaces — 174
5.2.2	Some special properties of Sobolev-Orlicz spaces — 179
5.2.3	On the weak convergence of fluxes to flux — 183
5.3	On approximated optimal control problem in coefficients and its properties — 187
5.4	Asymptotic analysis of OCP (5.19)–(5.23) — 198
6	Approximation of an Optimal Control Problem in Coefficient for Variational Inequality with Anisotropic p-Laplacian — 211
6.1	Setting of the optimal control problem — 212
6.2	Existence of optimal solutions — 216
6.3	Regularization of OCP — 218
6.4	Asymptotic analysis of approximating OCP — 222
7	On Unbounded Optimal Controls in Coefficients for Ill-Posed Elliptic Dirichlet Boundary Value Problems — 226
7.1	Notation and preliminaries — 227
7.2	Weak convergence in variable L^2 -spaces associated with \mathbb{S}_{sym}^N -matrices — 233
7.3	Setting of the optimal control problem — 236
7.4	On variational solutions to OCP (7.1)–(7.3) and their approximation — 244
7.5	On attainability of non-variational optimal solutions — 261
7.6	On some properties of unbounded bilinear forms associated with skew-symmetric $L^2(\Omega)$ -matrices — 278
7.6.1	Preliminaries — 279
7.6.2	Motivating example — 282
7.6.3	On formula of integration by parts for measurable functions — 287
7.6.4	On substantiation of formula (7.198) for a non-Lipschitz case — 289
7.6.5	Proof of the uniqueness result — 290
8	On Optimal L^1-Control in Coefficients for Quasi-Linear Dirichlet Boundary Value Problem with BMO-Anisotropic p-Laplacian — 294
8.1	Notation and preliminaries — 296

8.2	Setting of the optimal control problem —	301
8.3	On consistency of optimal control problem (8.28)–(8.31) —	305
8.4	Existence of Optimal Pairs —	314
8.5	On higher integrability of the gradient of an approximation solution —	316
8.6	On density of smooth compactly supported functions in $W_{0,B}^{1,p}(\Omega)$ —	325

	Bibliography —	331
--	----------------	-----