
Contents

1	Introduction and Main Results	1
2	Semigroup Theory	13
2.1	Analytic Semigroups	13
2.1.1	Generation of Analytic Semigroups	13
2.1.2	Fractional Powers	24
2.1.3	The Semilinear Cauchy Problem	26
2.2	Markov Processes and Feller Semigroups	27
2.2.1	Markov Processes	28
2.2.2	Markov Transition Functions	31
2.2.3	Path Functions of Markov Processes	35
2.2.4	Strong Markov Processes and Transition Functions	36
2.2.5	Markov Transition Functions and Feller Semigroups	39
2.2.6	Generation Theorems of Feller Semigroups	44
3	L^p Theory of Pseudo-Differential Operators	55
3.1	Function Spaces	55
3.2	Fourier Integral Operators	62
3.2.1	Symbol Classes	62
3.2.2	Phase Functions	64
3.2.3	Oscillatory Integrals	65
3.2.4	Fourier Integral Operators	67
3.3	Pseudo-Differential Operators	67
4	L^p Approach to Elliptic Boundary Value Problems	77
4.1	The Dirichlet Problem	77
4.2	Formulation of a Boundary Value Problem	80
4.3	Reduction to the Boundary	81
5	Proof of Theorem 1.1	87
5.1	Boundary Value Problem with Spectral Parameter	87
5.2	Proof of Estimate (1.2)	89

6 A Priori Estimates	95
7 Proof of Theorem 1.2	101
7.1 Proof of Theorem 1.2, Part (i)	101
7.1.1 Proof of Proposition 7.2	108
7.2 Proof of Theorem 1.2, Part (ii)	110
8 Proof of Theorem 1.3, Part (i)	113
8.1 The Space $C_0(\overline{D} \setminus M)$	113
8.2 Sobolev's Imbedding Theorems	114
8.3 Proof of Part (i) of Theorem 1.3	115
9 Proof of Theorem 1.3, Part (ii)	125
9.1 General Existence Theorem for Feller Semigroups	125
9.2 Feller Semigroups with Reflecting Barrier	140
9.3 Proof of Theorem 1.4	149
9.4 Proof of Part (ii) of Theorem 1.3	159
10 Application to Semilinear Initial-Boundary Value Problems	161
10.1 Local Existence and Uniqueness Theorems	161
10.2 Fractional Powers and Imbedding Theorems	163
10.3 Proof of Theorems 10.1 and 10.2	165
10.3.1 Proof of Theorem 10.1	165
10.3.2 Proof of Theorem 10.2	166
11 Concluding Remarks	169
A The Maximum Principle	175
References	179
Index	183