

## Contents

		<i>page</i>
	<i>Preface</i>	xi
	<i>Frequently Used Notation</i>	xv
<b>1</b>	<b>Markov Processes and Ergodic Properties</b>	1
1.1	Introduction	1
1.2	Markov processes	4
1.3	Semigroups associated with Markov processes	9
1.4	The martingale approach	14
1.5	Ergodic theory of Markov processes	15
1.6	Diffusion processes	27
1.7	Bibliographical note	29
<b>2</b>	<b>Controlled Diffusions</b>	30
2.1	Introduction	30
2.2	Solution concepts	30
2.3	Relaxed controls	47
2.4	A topology for Markov controls	57
2.5	Stability of controlled diffusions	59
2.6	Stability of nondegenerate controlled diffusions	64
2.7	The discounted and ergodic control problems	82
2.8	Bibliographical note	85
<b>3</b>	<b>Nondegenerate Controlled Diffusions</b>	86
3.1	Introduction	86
3.2	Convex analytic properties	86
3.3	Uniform recurrence properties	94
3.4	Existence of optimal controls	100
3.5	The discounted control problem	107
3.6	The HJB equation under a near-monotone assumption	112
3.7	The stable case	124
3.8	One-dimensional controlled diffusions	147
3.9	Bibliographical note	153

<b>4</b>	<b>Various Topics in Nondegenerate Diffusions</b>	154
4.1	Introduction	154
4.2	Multi-objective problems	154
4.3	Singular perturbations in ergodic control	160
4.4	Control over a bounded domain	172
4.5	An application	174
4.6	Bibliographical note	193
<b>5</b>	<b>Controlled Switching Diffusions</b>	194
5.1	The mathematical model	194
5.2	Cooperative elliptic systems	199
5.3	Recurrence and ergodicity of fully coupled switching diffusions	204
5.4	Existence of an optimal control	210
5.5	HJB equations	211
5.6	The general case	212
5.7	An example	213
5.8	Bibliographical note	216
<b>6</b>	<b>Controlled Martingale Problems</b>	217
6.1	Introduction	217
6.2	The controlled martingale problem	218
6.3	Ergodic occupation measures	221
6.4	Extremal solutions	231
6.5	Existence results	241
6.6	The linear programming formulation	246
6.7	Krylov's Markov selection	248
6.8	Bibliographical note	252
<b>7</b>	<b>Degenerate Controlled Diffusions</b>	253
7.1	Introduction	253
7.2	Controlled martingale formulation	253
7.3	Asymptotically flat controlled diffusions	254
7.4	Partially nondegenerate controlled diffusions	263
7.5	Bibliographical note	278
<b>8</b>	<b>Controlled Diffusions with Partial Observations</b>	279
8.1	Introduction	279
8.2	Controlled nonlinear filters	280
8.3	The separated control problem	285
8.4	Split chain and the pseudo-atom	288
8.5	Dynamic programming	293
8.6	Bibliographical note	299

*Contents* ix

<b>Epilogue</b>	300
<b>Appendix Results from Second Order Elliptic Equations</b>	303
<i>References</i>	311
<i>Index of symbols</i>	319
<i>Subject index</i>	321