

Contents

1	Multiservice Loss Systems	1
1.1	The Erlang Loss System	2
1.2	Loss Networks with Fixed Routing	3
1.3	Loss Networks with Dynamic Routing	6
1.4	The ATM Multiplexer	7
1.5	ATM Networks	13
1.6	Multiservice Interconnection Networks	16
2	The Stochastic Knapsack	17
2.1	The Model and Notation	17
2.2	Performance Evaluation	22
2.3	Virtual Channel Establishment for ATM Multiplexers	26
2.4	Contiguous Slot Assignment	33
2.5	Stochastic Comparisons	39
2.6	Monotonicity Properties for the Stochastic Knapsack	42
2.7	Asymptotic Analysis of the Stochastic Knapsack	50
2.8	The Stochastic Knapsack with Continuous Sizes*	60
2.9	Bibliographical Notes	67
2.10	Summary of Notation	68
3	The Generalized Stochastic Knapsack	71
3.1	Preliminaries	72
3.2	A Recursive Algorithm	75
3.3	A Convolution Algorithm	80
3.4	Calculating Blocking Probabilities*	83
3.5	Refined Convolution Algorithms*	85
3.6	Monotonicity Properties	89

3.7	ATM with Burst Multiplexing	92
3.8	Circuit-Switched Access Networks	96
3.9	Sharing Memory*	104
3.10	Objects with Continuous Sizes*	107
3.11	Bibliographical Remarks	109
3.12	Summary of Notation	109
4	Admission Control	113
4.1	Admission Policies	114
4.2	Optimization Concepts	120
4.3	Optimal Complete Partitioning Policies	122
4.4	Optimal Coordinate Convex Policies	124
4.5	Markov Decision Processes	129
4.6	Optimal Admission to Broadband Multiplexers	136
4.7	Service Separation for ATM	141
4.8	Bibliographical Notes	151
4.9	Summary of Notation	151
5	Product-Form Loss Networks	155
5.1	The Model	156
5.2	Basic Properties	163
5.3	Algorithms for Generalized Access Networks	169
5.4	Algorithms for Hierarchical Access Networks	177
5.5	The Reduced Load Approximation for Single-Service Networks	181
5.6	The Reduced Load Approximation for Multiservice Networks	187
5.7	Implied Costs	190
5.8	Asymptotic Analysis	196
5.9	Loss Models for ATM Networks	206
5.10	ATM Networks: Route Separation	211
5.11	ATM Networks: Multiplexing Across Routes	213
5.12	Continuous Bandwidths*	218
5.13	Cellular Networks and Wavelength-Division Multiplexing Networks*	220
5.14	Bibliographical Notes	223
5.15	Summary of Notation	224

6	Monte Carlo Summation for Product-Form Loss Networks	229
6.1	The Theory of Monte Carlo Summation	231
6.2	Numerical Examples	239
6.3	Estimates for Revenue Sensitivity	244
6.4	Loss Network Analyzer: A Software Package	246
6.5	Bibliographical Notes	247
6.6	Summary of Notation	247
7	Dynamic Routing in Telephone Networks	249
7.1	An Overview of Contemporary Routing Techniques	251
7.2	Bounds on Average Revenue	255
7.3	Reduced Load Approximation for Dynamic Routing	261
7.4	Symmetric Networks	263
7.5	Computational Effort of Reduced Load Approximation	271
7.6	Computational Examples for the Reduced Load Approximation	276
7.7	Bibliographical Notes	281
7.8	Summary of Notation	283
8	Dynamic Routing in ATM Networks	285
8.1	ATM Routing Concepts	286
8.2	Static-Service, Dynamic-Route Separation	287
8.3	Static-Service Separation, Multiplexing Across Routes	290
8.4	Dynamic-Service, Dynamic-Route Separation	298
8.5	Dynamic-Service Separation, Multiplexing Across Routes	300
8.6	The Reduced Load Approximation for Multiservice Networks with Dynamic Routing	301
8.7	Bibliographical Notes	304
9	Multiservice Interconnection Networks	305
9.1	Model Description	307
9.2	Three-Stage Clos Networks	309
9.3	Cantor Networks	314
9.4	Rearrangeable Interconnection Networks	320
9.5	Bibliographical Notes	322
9.6	Summary of Notation	322

Bibliography

325

Index

341