

Table of Contents

Preface	ix
Chapter 1. Computational Probability: An Introduction	1
1.1. An Historical Perspective	1
1.2. Recognizing Recurrence Relations	3
1.3. Main Problem Set for Chapter 1	15
Easier Problems	15
Average Problems	19
Harder Problems	25
Challenging Problems	32
Some Special Problems	36
Chapter 2. Solving Equations	38
2.1. Common Equations	38
2.2. Implicit Equations	43
2.3. Main Problem Set for Chapter 2	46
Easier Problems	46
Average Problems	51
Harder Problems	56
Challenging Problems	66
Chapter 3. Functions of Random Variables	75
3.1. Introduction	75
3.2. Sums of Random Variables	78
3.3. Maxima and Minima of Random Variables	82
3.4. The Inclusion - Exclusion Formula	85
3.5. A Waiting Time in Multinomial Trials	88
3.6. Main Problem Set for Chapter 3	92
Easier Problems	92
Average Problems	98
Harder Problems	105

Challenging Problems	117
Problems Requiring Numerical Integration	128
Problems on Inclusion - Exclusion	133
Chapter 4. Discrete-Time Markov Chains	135
4.1. Matrix Formulas for Finite Markov Chains	135
4.2. Some Infinite-State Markov Chains	144
4.3. The Discrete Markovian Arrival Process	149
4.4. Main Problem Set for Chapter 4	153
Easier Problems	154
Average Problems	166
Harder Problems	189
Challenging Problems	207
Chapter 5. Continuous-Time Markov Chains	229
5.1. Matrix Formulas for Finite Markov Chains	229
5.2. Main Problem Set for Chapter 5	237
Easier Problems	238
Average Problems	245
Harder Problems	255
Challenging Problems	272
Chapter 6. Experimentation and Visualization	292
6.1. Introduction	292
6.2. The Alias Method	296
6.3. Understanding Steady-State Behavior	298
6.4. Main Problem Set for Chapter 6	303
Easier Problems	303
Average Problems	309
Harder Problems	332
Challenging Problems	355
References	367
Appendix 1. Some Topics from Matrix Analysis	369
A.1.1: Functions of a Matrix	369
A.1.2: The Kronecker Product	373
A.1.3: The Perron - Frobenius Eigenvalue	374
Appendix 2. Phase - Type Distributions	379

A.2.1: <i>PH</i> -Distributions	379
A.2.2: The <i>PH</i> -Renewal Process	388
Appendix 3. The Markovian Arrival Process	393
A.3.1: Description of the <i>MAP</i>	393
A.3.2: Probability Distributions for the <i>MAP</i>	395
Solutions to Selected Problems	399
Index	459