

Contents

Foreword	v
Part I Prologue	
1. MULTIACCESS IN CABLE NETWORKS	3
1.1 Multiaccess Communication	3
1.2 Methods for Multiaccess	5
1.3 Data Transfer in Cable Networks	7
1.4 Performance Analysis of Cable Networks	10
1.5 Outline	13
1.6 Selected Bibliography	18
2. KEY MODELS	19
2.1 Contention Trees	19
2.2 The Repairman Model	24
2.3 The Bulk Service Queue	27
2.4 Tandem Queues with Shared Service Capacity	31
Part II Contention Trees	
3. BASIC PROPERTIES OF CONTENTION TREES	37
3.1 Introduction	37
3.2 Formal Tree Models	39
3.3 Tree Statistics	47
3.4 Proofs	57
3.5 Conclusion	66

4. DELAY MODELS FOR CONTENTION TREES IN CLOSED POPULATIONS	69
4.1 Introduction	69
4.2 Access via Contention Trees	73
4.3 Properties of the Basic Model	75
4.4 ROS Discipline	78
4.5 GROS Discipline	83
4.6 GPROS Discipline	84
4.7 Numerical Results	87
4.8 Conclusion	91
5. THE REPAIRMAN MODEL WITH GROS	93
5.1 Introduction	93
5.2 Model Description	95
5.3 Approach and Main Results	99
5.4 Transfer Map	102
5.5 Proofs of Theorems	105
5.6 Conclusion	111
Part III Bulk Service	
6. METHODOLOGY	115
6.1 Historical Perspective	115
6.2 Generating Function Technique	119
6.3 Random Walk Theory	125
6.4 Wiener–Hopf Technique	128
6.5 Summary	131
7. PERIODIC SCHEDULING	143
7.1 Introduction	143
7.2 Model Description	144
7.3 Queue Length	145
7.4 Packet Delay	150
7.5 Numerical Results	156
7.6 Conclusion	158

<i>Contents</i>	ix
8. RESERVATIONS WITH TRANSMISSION DELAYS	161
8.1 Introduction	161
8.2 The Delayed Bulk Service Queue	164
8.3 Adaptive Scheduling Strategies	171
8.4 Numerical Assessment	174
8.5 Conclusion	178
Part IV Shared Service Capacity	
9. A TANDEM QUEUE WITH COUPLED PROCESSORS	189
9.1 Introduction	189
9.2 Model Description	190
9.3 Analysis of the Kernel	192
9.4 Boundary Value Problem I	196
9.5 Boundary Value Problem II	198
9.6 Performance Measures	201
10. A TWO-STATION NETWORK WITH COUPLED PROCESSORS	213
10.1 Introduction	213
10.2 Model Description	214
10.3 Performance Measures	217
10.4 Preemptive Priority	219
10.5 Boundary Value Problem	221
10.6 Conclusion and Further Research	225
Part V Epilogue	
11. CABLE NETWORKS REVISITED	229
11.1 Introduction	229
11.2 Traffic Model	230
11.3 Total Average Packet Delay	232
11.4 Numerical Assessment	234
11.5 Further Research	237

References	241
About the Authors	253