

# Contents

## **Part I Two-Dimensional Traffic Models of Integrated Voice/Data Cellular Wireless Networks**

<b>1 Performance Analysis of Multi-Parametric Call Admission Control (CAC) Strategies in Unbuffered Cellular Wireless Networks</b>	<b>3</b>
1.1 CAC Based on the Guard Channels Strategy . . . . .	3
1.2 CAC Based on a Cutoff Strategy . . . . .	12
1.3 Numerical Results . . . . .	19
1.4 Conclusion . . . . .	28
References . . . . .	29
<b>2 Performance Analysis of Call-Handling Processes in Buffered Cellular Wireless Networks</b>	<b>31</b>
2.1 Models with Queues for h-Calls . . . . .	31
2.1.1 Models with Finite Queues . . . . .	32
2.1.2 Models with Infinite Queues . . . . .	39
2.1.3 Numerical Results . . . . .	44
2.2 Models with Queues for o-Calls . . . . .	49
2.2.1 Models Without Reassignment of Channels . . . . .	50
2.2.2 Models with Reassignment of Channels . . . . .	54
2.2.3 Numerical Results . . . . .	66
2.3 Conclusion . . . . .	75
References . . . . .	76
<b>3 QoS Optimization Problems in Cellular Wireless Networks</b>	<b>77</b>
3.1 QoS Optimization Problems in Cells Without Queues . . . . .	77
3.1.1 Optimization of Models with Guard Channels for Handover Calls . . . . .	77
3.1.2 Optimization of Models with Individual Channels for Handover Calls . . . . .	80
3.2 QoS Optimization Problems in Cells with Queues . . . . .	84
3.2.1 QoS Optimization Problems in Cells with a Limited Queue of h-Calls . . . . .	84

3.2.2 QoS Optimization Problems in Cells with an Unlimited Queue of h-Calls . . . . .	88
3.3 Conclusion . . . . .	90
References . . . . .	91

## Part II Multi-Dimensional Models of Multi-Service Networks

<b>4 Models of Multi-Rate Systems with Inelastic Calls . . . . .</b>	<b>95</b>
4.1 General Models of Unbuffered Multi-Rate Systems . . . . .	95
4.1.1 Complete Sharing Strategy . . . . .	96
4.1.2 Complete Sharing with Equalization Strategy . . . . .	100
4.1.3 Trunk Reservation Strategy . . . . .	102
4.1.4 Numerical Results . . . . .	105
4.2 Gimpelson-Type Multi-Rate Systems . . . . .	116
4.2.1 Unbuffered Models with a Special Group of Channels for Wide-Band Calls . . . . .	116
4.2.2 Models with Guard Channels and Buffers for Wide-Band Calls . . . . .	119
4.2.3 Numerical Results . . . . .	123
4.3 Conclusion . . . . .	128
References . . . . .	129
<b>5 Models of Mixed Multi-Rate Systems . . . . .</b>	<b>131</b>
5.1 Unbuffered Models . . . . .	131
5.1.1 Models with a Continuous Band . . . . .	132
5.1.2 Models with a Discrete Band . . . . .	136
5.2 Models with Buffers for Elastic Calls . . . . .	138
5.3 Numerical Results . . . . .	143
5.4 Conclusion . . . . .	146
References . . . . .	148
<b>6 Parametric Optimization Problems in Multi-Rate Systems . . . . .</b>	<b>149</b>
6.1 Problems for Unbuffered Gimpelson's Models . . . . .	149
6.1.1 Problem of Equivalent Capacity with the CS-Strategy . . .	150
6.1.2 Problems of Finding the Optimal CAC Parameters with the TR-Strategy . . . . .	151
6.1.3 Problems of Finding the Optimal CAC Parameters with the SGC-Strategy . . . . .	158
6.2 Problems for Buffered Gimpelson's Models . . . . .	160
6.3 Problems for Mixed Models . . . . .	162
6.4 Conclusion . . . . .	164
References . . . . .	165
<b>7 Markov Decision Processes (MDP) Approach to Optimization Problems for Multi-Rate Systems . . . . .</b>	<b>167</b>
7.1 Hierarchical Phase-Merging Algorithm for MDP Problems . . . .	167
7.2 Finding the Optimal Access Strategy . . . . .	173

Contents	xi
7.3 Finding the Sub-Optimal Access Strategy . . . . .	181
7.4 Numerical Results . . . . .	184
7.5 Conclusion . . . . .	185
References . . . . .	186
<b>Appendix</b> . . . . .	187
References . . . . .	190
<b>Index</b> . . . . .	191