

CONTENTS

Preface

1. INTRODUCTION to GRAPHS	1
1.1 Fundamentals of Graph Theory	2
– <i>Jonathan L. Gross and Jay Yellen</i>	
1.2 Families of Graphs and Digraphs	20
– <i>Lowell W. Beineke</i>	
1.3 History of Graph Theory	29
– <i>Robin J. Wilson</i>	
Glossary	50
2. GRAPH REPRESENTATION	56
2.1 Computer Representation of Graphs	57
– <i>Alfred V. Aho</i>	
2.2 The Graph Isomorphism Problem	68
– <i>Mark Goldberg</i>	
2.3 The Reconstruction Problem	79
– <i>Josef Lauri</i>	
2.4 Recursively Constructed Graphs	99
– <i>R. B. Borie, R. Gary Parker, and C. A. Tovey</i>	
Glossary	119
3. DIRECTED GRAPHS	126
3.1 Basic Digraph Models and Properties	127
– <i>Jay Yellen</i>	
3.2 Directed Acyclic Graphs	142
– <i>Stephen B. Maurer</i>	
3.3 Tournaments	156
– <i>K. B. Reid</i>	
Glossary	185
4. CONNECTIVITY and TRAVERSABILITY	193
4.1 Connectivity: Properties and Structure	194
– <i>Josep Fàbrega and Miguel Angel Fiol</i>	
4.2 Eulerian Graphs	214
– <i>Herbert Fleischner</i>	
4.3 Chinese Postman Problems	237
– <i>R. Gary Parker</i>	
4.4 DeBruijn Graphs and Sequences	253
– <i>A. K. Dewdney</i>	
4.5 Hamiltonian Graphs	261
– <i>Ronald J. Gould</i>	
4.6 Traveling Salesman Problems	279
– <i>Gregory Gutin</i>	
4.7 Further Topics in Connectivity	300
– <i>Josep Fàbrega and Miguel Angel Fiol</i>	
Glossary	330

5. COLORINGS and RELATED TOPICS

340

5.1	Graph Coloring.....	341
	– <i>Zsolt Tuza</i>	
5.2	Further Topics in Graph Coloring.....	365
	– <i>Zsolt Tuza</i>	
5.3	Independent Sets and Cliques.....	389
	– <i>Gregory Gutin</i>	
5.4	Factors and Factorization.....	403
	– <i>Michael Plummer</i>	
5.5	Perfect Graphs.....	431
	– <i>Alan Tucker</i>	
5.6	Applications to Timetabling.....	445
	– <i>Edmund Burke, Dominique de Werra, and Jeffrey Kingston</i>	
	Glossary.....	475

6. ALGEBRAIC GRAPH THEORY

484

6.1	Automorphisms.....	485
	– <i>Mark E. Watkins</i>	
6.2	Cayley Graphs.....	505
	– <i>Brian Alspach</i>	
6.3	Enumeration.....	516
	– <i>Paul K. Stockmeyer</i>	
6.4	Graphs and Vector Spaces.....	533
	– <i>Krishnaiyan “KT” Thulasiraman</i>	
6.5	Spectral Graph Theory.....	557
	– <i>Michael Doob</i>	
6.6	Matrioidal Methods in Graph Theory.....	574
	– <i>James Oxley</i>	
	Glossary.....	599

7. TOPOLOGICAL GRAPH THEORY

610

7.1	Graphs on Surfaces.....	611
	– <i>Tomaz Pisanski and Primož Potočnik</i>	
7.2	Minimum and Maximum Imbeddings.....	625
	– <i>Jianer Chen</i>	
7.3	Genus Distributions.....	642
	– <i>Jonathan L. Gross</i>	
7.4	Voltage Graphs.....	661
	– <i>Jonathan L. Gross</i>	
7.5	The Genus of a Group.....	684
	– <i>Thomas W. Tucker</i>	
7.6	Maps.....	696
	– <i>Andrew Vince</i>	
7.7	Representativity.....	722
	– <i>Dan Archdeacon</i>	
7.8	Triangulations.....	737
	– <i>Seiya Negami</i>	
7.9	Graphs and Finite Geometries.....	761
	– <i>Arthur T. White</i>	
	Glossary.....	770

8.	ANALYTIC GRAPH THEORY	787
8.1	Extremal Graph Theory	788
	– <i>Béla Bollobás and Vladimir Nikiforov</i>	
8.2	Random Graphs	817
	– <i>Nicholas Wormald</i>	
8.3	Ramsey Graph Theory	837
	– <i>Ralph Faudree</i>	
8.4	The Probabilistic Method	860
	– <i>Alan Frieze</i>	
	Glossary	868
9.	GRAPHICAL MEASUREMENT	872
9.1	Distance in Graphs	873
	– <i>Gary Chartrand and Ping Zhang</i>	
9.2	Domination in Graphs	889
	– <i>Teresa W. Haynes and Michael A. Henning</i>	
9.3	Tolerance Graphs	910
	– <i>F. R. McMorris</i>	
9.4	Bandwidth	922
	– <i>Robert C. Brigham</i>	
	Glossary	945
10.	GRAPHS in COMPUTER SCIENCE	952
10.1	Searching	953
	– <i>Harold N. Gabow</i>	
10.2	Dynamic Graph Algorithms	985
	– <i>Camil Demetrescu, Irene Finocchi, and Giuseppe F. Italiano</i>	
10.3	Drawings of Graphs	1015
	– <i>Giuseppe Liotta and Roberto Tamassia</i>	
10.4	Algorithms on Recursively Constructed Graphs	1046
	– <i>R. B. Borie, R. Gary Parker, and C. A. Tovey</i>	
	Glossary	1067
11.	NETWORKS and FLOWS	1074
11.1	Maximum Flows	1075
	– <i>Clifford Stein</i>	
11.2	Minimum Cost Flows	1087
	– <i>Lisa Fleischer</i>	
11.3	Matchings and Assignments	1103
	– <i>Douglas R. Shier</i>	
11.4	Communication Network Design Models	1117
	– <i>Prakash Mirchandani and David Simchi-Levi</i>	
	Glossary	1139
	INDEX	1143