W.D. Wallis

A Beginner's Guide to Graph Theory

Birkhäuser
Boston • Basel • Berlin

Contents

14) 20	Preface						
	List	of Figures	xv				
1	Graphs						
	1.1	Sets, Binary Relations and Graphs	1				
eti. Zize	1.2	Some Definitions	4				
us Či	1.3	Degree	11				
2	Wall	ks, Paths and Cycles	15				
	2.1	Basic Ideas	15				
34	2.2	Weights and Shortest Paths	19				
	2.3	Euler Walks	23				
	2.4	Hamilton Cycles	26				
V r	2.5	The Traveling Salesman Problem	31				
3	Cuts and Connectivity						
* }	3.1	Cutpoints and Bridges	35				
15.5	3.2	Blocks	37				
	3.3	Connectivity	40				
4	Trees						
	4.1	Characterizations of Trees	43				
	4.2	Spanning Trees	46				
. (`.	4.3	Minimal Spanning Trees	51				

5	Line	ar Spaces Associated with Graphs 55					
3	5.1	Finite Fields and Vector Spaces					
	5.2	The Power Set as a Vector Space					
	5.3	•					
		· · · · · · · · · · · · · · · · · · ·					
	5.4	•					
	5.5	Bases and Spanning Trees					
6	Factorizations 69						
•	6.1	One-Factorizations					
	6.2	Tournament Applications of One-Factorizations					
	6.3	A General Existence Theorem					
	6.4	Graphs Without One-Factors					
	0.4	Orapiis William One-Luciois					
7	Gra	ph Colorings 85					
	7.1	Vertex Colorings					
	7.2	Brooks' Theorem					
	7.3	Counting Vertex Colorings					
	7.4	Edge-Colorings					
	7.5	Class 2 Graphs					
		-					
8		arity 105					
	8.1	Representations and Crossings					
	8.2	Euler's Formula					
	8.3	Maps, Graphs and Planarity					
9	Ramsey Theory 115						
-	9.1	The Graphical Case of Ramsey's Theorem					
	9.2	Ramsey Multiplicity					
	9.3	Application of Sum-Free Sets					
	9.4	Bounds on Classical Ramsey Numbers					
	9.5	The General Case of Ramsey's Theorem					
	9.5	The General Case of Ramsey's Theorem					
10	Digr	aphs 131					
	10.1	aphs 131 Basic Ideas					
		Orientations and Tournaments					
		Directed Euler Walks					
11		ical Paths 143					
		Activity Digraphs					
		Critical Path Analysis					
	11.3	Critical Paths Under Uncertainty					
12	Flor	rs in Networks					
14		Transportation Networks and Flows					
		Maximal Flows					
	12.3	The Max Flow Min Cut Theorem					

		Contents	xiii
	12.4	The Max Flow Min Cut Algorithm	. 173
		Supply and Demand Problems	
3	Com	putational Considerations	185
		Computation Time	. 185
		Data Structures	
	13.3	Some Graph Algorithms	. 190
		Intractability	
	Refe	rences	197
	Hint	s	205
	Ansv	wers and Solutions	207
	Inde	x	225