

# Contents

<b>Chapter I</b>	
<b>Fundamentals</b>	<b>1</b>
1. Definitions	1
2. Paths, Cycles and Trees	6
3. Hamilton Cycles and Euler Circuits	11
4. Planar Graphs	16
5. An Application of Euler Trails to Algebra	19
Exercises	22
Notes	25
<b>Chapter II</b>	
<b>Electrical Networks</b>	<b>26</b>
1. Graphs and Electrical Networks	26
2. Squaring the Square	33
3. Vector Spaces and Matrices Associated with Graphs	35
Exercises	41
Notes	43
<b>Chapter III</b>	
<b>Flows, Connectivity and Matching</b>	<b>44</b>
1. Flows in Directed Graphs	45
2. Connectivity and Menger's Theorem	50
3. Matching	53
4. Tutte's 1-Factor Theorem	58
Exercises	61
Notes	66

<b>Chapter IV</b>	
<b>Extremal Problems</b>	<b>67</b>
1. Paths and Cycles	68
2. Complete Subgraphs	71
3. Hamilton Paths and Cycles	75
4. The Structure of Graphs	80
Exercises	84
Notes	87
 <b>Chapter V</b>	
<b>Colouring</b>	<b>88</b>
1. Vertex Colouring	89
2. Edge Colouring	93
3. Graphs on Surfaces	95
Exercises	98
Notes	102
 <b>Chapter VI</b>	
<b>Ramsey Theory</b>	<b>103</b>
1. The Fundamental Ramsey Theorems	103
2. Monochromatic Subgraphs	107
3. Ramsey Theorems in Algebra and Geometry	110
4. Subsequences	115
Exercises	119
Notes	121
 <b>Chapter VII</b>	
<b>Random Graphs</b>	<b>123</b>
1. Complete Subgraphs and Ramsey Numbers—The Use of the Expectation	124
2. Girth and Chromatic Number—Altering a Random Graph	127
3. Simple Properties of Almost All Graphs—The Basic Use of Probability	130
4. Almost Determined Variables—The Use of the Variance	133
5. Hamilton Cycles—The Use of Graph Theoretic Tools	139
Exercises	142
Notes	144
 <b>Chapter VIII</b>	
<b>Graphs and Groups</b>	<b>146</b>
1. Cayley and Schreier Diagrams	146
2. Applications of the Adjacency Matrix	155
3. Enumeration and Pólya's Theorem	162
Exercises	169
Notes	173
 <b>Subject Index</b>	<b>175</b>
 <b>Index of Symbols</b>	<b>179</b>