

Contents

<i>Preface</i>	<i>page</i> xiii
PART I Basic Models	
1 Random Graphs	3
1.1 Models and Relationships	3
1.2 Thresholds and Sharp Thresholds	8
1.3 Pseudo-Graphs	16
1.4 Exercises	17
1.5 Notes	18
2 Evolution	19
2.1 Sub-Critical Phase	19
2.2 Super-Critical Phase	32
2.3 Phase Transition	38
2.4 Exercises	44
2.5 Notes	46
3 Vertex Degrees	48
3.1 Degrees of Sparse Random Graphs	48
3.2 Degrees of Dense Random Graphs	54
3.3 Exercises	60
3.4 Notes	61
4 Connectivity	63
4.1 Connectivity	63
4.2 k -Connectivity	67
4.3 Exercises	69
4.4 Notes	69

viii	<i>Contents</i>	
5	Small Subgraphs	71
5.1	Thresholds	71
5.2	Asymptotic Distributions	75
5.3	Exercises	77
5.4	Notes	78
6	Spanning Subgraphs	81
6.1	Perfect Matchings	81
6.2	Hamilton Cycles	89
6.3	Long Paths and Cycles in Sparse Random Graphs	93
6.4	GREEDY Matching Algorithm	95
6.5	Random Subgraphs of Graphs with Large Minimum Degree	98
6.6	Spanning Subgraphs	102
6.7	Exercises	103
6.8	Notes	106
7	Extreme Characteristics	110
7.1	Diameter	110
7.2	Largest Independent Sets	116
7.3	Interpolation	120
7.4	Chromatic Number	122
7.5	Eigenvalues	128
7.6	Exercises	133
7.7	Notes	135
8	Extremal Properties	138
8.1	Containers	138
8.2	Ramsey Properties	140
8.3	Turán Properties	142
8.4	Exercises	144
8.5	Notes	145
	PART II Basic Model Extensions	
9	Inhomogeneous Graphs	149
9.1	Generalized Binomial Graph	149
9.2	Expected Degree Model	156
9.3	Kronecker Graphs	163
9.4	Exercises	168
9.5	Notes	169

	<i>Contents</i>	ix
10 Fixed Degree Sequence		173
10.1 Configuration Model		173
10.2 Connectivity of Regular Graphs		186
10.3 $\mathbb{G}_{n,r}$ versus $\mathbb{G}_{n,p}$		189
10.4 Exercises		199
10.5 Notes		200
11 Intersection Graphs		202
11.1 Binomial Random Intersection Graphs		202
11.2 Random Geometric Graphs		212
11.3 Exercises		220
11.4 Notes		222
12 Digraphs		226
12.1 Strong Connectivity		226
12.2 Hamilton Cycles		234
12.3 Exercises		236
12.4 Notes		237
13 Hypergraphs		239
13.1 Hamilton Cycles		239
13.2 Perfect Matchings		243
13.3 Exercises		256
13.4 Notes		258
PART III Other models		
14 Trees		263
14.1 Labeled Trees		263
14.2 Recursive Trees		270
14.3 Inhomogeneous Recursive Trees		279
14.4 Exercises		289
14.5 Notes		290
15 Mappings		294
15.1 Permutations		294
15.2 Mappings		297
15.3 Exercises		304
15.4 Notes		305
16 k-out		307
16.1 Connectivity		307
16.2 Perfect Matchings		310

x	<i>Contents</i>	
	16.3 Hamilton Cycles	319
	16.4 Nearest Neighbor Graphs	322
	16.5 Exercises	326
	16.6 Notes	327
17	Real World Networks	329
	17.1 Preferential Attachment Graph	329
	17.2 A General Model of Web Graphs	335
	17.3 Small World	343
	17.4 Exercises	345
	17.5 Notes	347
18	Weighted Graphs	349
	18.1 Minimum Spanning Tree	349
	18.2 Shortest Paths	353
	18.3 Minimum Weight Assignment	356
	18.4 Exercises	360
	18.5 Notes	361
19	Brief Notes on Uncovered Topics	364
	19.1 Contiguity	364
	19.2 Edge Colored Random Graphs	365
	19.3 Games	365
	19.4 Graph Searching	367
	19.5 H -free process	368
	19.6 Logic and Random Graphs	369
	19.7 Planarity	369
	19.8 Planted Cliques, Cuts and Hamilton cycles	370
	19.9 Random Lifts	371
	19.10 Random Simplicial Complexes	371
	19.11 Random Subgraphs of the n -cube	372
	19.12 Random Walks on Random Graphs	372
	19.13 Stable Matching	373
	19.14 Universal graphs	374
	PART IV Tools and Methods	
20	Moments	377
	20.1 First and Second Moment Method	377
	20.2 Convergence of Moments	380
	20.3 Stein–Chen Method	384

<i>Contents</i>		xi
21	Inequalities	386
21.1	Binomial Coefficient Approximation	386
21.2	Balls in Boxes	387
21.3	FKG Inequality	389
21.4	Sums of Independent Bounded Random Variables	390
21.5	Sampling Without Replacement	394
21.6	Janson's Inequality	396
21.7	Martingales. Azuma–Hoeffding Bounds	399
21.8	Talagrand's Inequality	405
21.9	Dominance	408
22	Differential Equations Method	410
23	Branching Processes	414
24	Entropy	416
24.1	Basic Notions	416
24.2	Shearer's Lemma	419
	<i>References</i>	420
	<i>Author Index</i>	456
	<i>Main Index</i>	462