

Contents

The Rado lecture	1
The Coming of the Matroids by W. T. Tutte	3
Appendix I: geometrical terminology	11
Appendix II: binary and regular matroids	13
The Invited Lectures	15
Polynomials in Finite Geometries by S. Ball	17
1 Introduction	17
2 Definitions and useful polynomials	18
3 Nuclei	21
4 Affine blocking sets	23
5 Non-Desarguesian planes	25
6 Maximal arcs	27
7 Unitals	30
Applications of Combinatorial Designs to Communications, Cryptography, and Networking by C. J. Colbourn, J. H. Dinitz, D. R. Stinson	37
0 Background	38
1 Optical orthogonal codes	39
2 Synchronous multiple access to channels	43
3 Group testing and superimposed codes	45
4 Erasure codes and information dispersal	48
5 Threshold and ramp schemes	54
6 Authentication codes	59
7 Resilient and correlation-immune functions	62
8 Multidrop networks	65
9 Channel graphs and interconnection networks	68
10 Partial match queries on files	72
11 Software testing	76
12 Disk layout and striping	78
13 (t, m, s) -nets and numerical integration	80
14 About things not said	87
Random Walks on Combinatorial Objects by Martin Dyer and Catherine Greenhill	101
1 Introduction	101
2 Notation and preliminaries	102
3 A computational framework	102

4	Review	109
5	Coupling	114
6	Path coupling	116
7	Perfect sampling	120
8	Negative results	128

Bose–Burton Type Theorems for Finite Projective, Affine and Polar Spaces by Klaus Metsch 137

1	Introduction	137
2	Blocking configurations for projective spaces	139
3	Variations of the Bose–Burton result in projective spaces	142
4	Spreads and partial spreads in $PG(d, q)$	144
5	A result in affine spaces	146
6	Ovoids and Spreads of finite classical polar spaces	146
7	Blocking lines by points in the polar spaces $Q^+(2n + 1, q)$, $U(2n + 1, q)$ and $Q(2n, q)$	150
8	The unitary polar spaces $U(2n, q)$	155
9	Unsolved problems	163

Geometric Graph Theory by János Pach 167

1	Introduction, basic definitions	167
2	Crossing-free geometric graphs	168
3	Unavoidable crossings	170
4	Forbidden geometric subgraphs—Multiple crossings	173
5	Forbidden geometric subgraphs—Non-crossing configurations	176
6	Ramsey-type results	181
7	Applications	185
8	Geometric hypergraphs	190

Recent Excluded Minor Theorems for Graphs by Robin Thomas 201

1	Introduction	201
2	Seymour’s splitter theorem	202
3	A splitter theorem for internally 4-connected graphs	204
4	A splitter theorem for cyclically 5-connected cubic graphs	207
5	Excluding a general graph	208
6	The graph minor theorem	209
7	Linklessly embeddable graphs	210
8	The four colour theorem	212
9	Hadwiger’s conjecture	213
10	Tutte’s edge 3-colouring conjecture	214
11	Pfaffian orientations	215

Contents	vii
Parity, Cycle Space, and K_4-Subdivisions in Graphs by C. Thomassen	223
1 Introduction	223
2 The cycle space of a graph and generating sets of cycles	224
3 The cycle space and collections of cycles determining uniquely a graph up to isomorphism	226
4 The cycle space generated by the cycles through two fixed edges	228
5 The cycle space of a graph and K_4 -subdivisions	229
6 Towards a characterization of the graphs containing no totally odd K_4 -subdivisions	231
7 Open problems	234
Models of Random Regular Graphs by N. C. Wormald	239
1 Introduction	239
2 Uniform model for random regular graphs	241
3 Other uniform models	265
4 The small subgraph conditioning method, contiguity, and superposition models	268
5 The generation problem	283
6 Algorithmically defined models	286
7 A wider perspective	287