

CONTENTS

PART IV $PG(3, q)$

15. LINES	3
15.1 Preliminaries	3
15.2 Coordinates, linear complexes and polarities	4
15.3 Quadrics	13
15.4 The representation of lines of $PG(3, q)$ in $PG(5, q)$	28
15.5 Notes and references	31
16. OVALOIDS AND QUADRICS	33
16.1 Ovaloids	33
16.2 Characterization of quadrics	37
16.3 Stereographic projection	40
16.4 λ -polarities	41
16.5 Notes and references	51
17. SPANS, SPREADS, AND PACKINGS	53
17.1 Regular spreads	53
17.2 Subregular spreads	62
17.3 Aregular spreads	64
17.4 Packings	66
17.5 Packings of $PG(3, 2)$ and the geometry of $\mathcal{H}_{5,2}$	68
17.6 k -spans	76
17.7 Hermitian arcs in $PG(4, q)$	86
17.8 Notes and references	90
18. k -CAPS	93
18.1 Arithmetical preliminaries	93
18.2 Examples of complete caps	96
18.3 Caps in ovaloids for q even	99
18.4 Caps in ovaloids for q odd	103
18.5 Notes and references	110
19. HERMITIAN SURFACES	112
19.1 Basic properties	112
19.2 Lines on \mathcal{U}	118
19.3 Regular systems of lines on \mathcal{U}	123
19.4 Sets of type $(1, n, q + 1)$	138
19.5 The characterization of Hermitian surfaces	156
19.6 Sets of odd type in $PG(3, 4)$	167
19.7 Notes and references	178

20. CUBIC SURFACES WITH 27 LINES	182
20.1 Existence of a double-six	182
20.2 Structure of the surface	191
20.3 Surfaces over small fields	202
20.4 Mappings onto the plane	213
20.5 The representation of \mathcal{F}_4 in $PG(5, 2)$	215
20.6 The classification of complex singular cubic surfaces by subsets of $PG(5, 2)$	221
20.7 The representation in $PG(5, 2)$ of the 28 bitangents of a plane quartic curve	223
20.8 Notes and references	228
21. TWISTED CUBICS AND k -ARCS	229
21.1 Elementary properties of the twisted cubic	229
21.2 Characterization of the twisted cubic for q odd	242
21.3 $(q+1)$ -arcs for q even	244
21.4 Further properties of the twisted cubic	253
21.5 Notes and references	259
APPENDIX III. ORDER OF AND ISOMORPHISMS AMONG THE SEMI-LINEAR GROUPS	260
AIII.1 Definitions	260
AIII.2 Comparative orders and isomorphisms in the same column of Table AIII.1	261
AIII.3 Simple groups	265
AIII.4 Isomorphisms between $DX(n, q)$ and A_m or S_m	265
AIII.5 Isomorphisms among $DX(n, q)$ for different characteristic p	265
AIII.6 Isomorphisms among $DX(n, q)$ for the same characteristic p	266
AIII.7 Notes and references	267
APPENDIX IV. THE NUMBER OF POINTS ON AN ALGEBRAIC VARIETY	269
AIV.1 The Weil conjectures	269
AIV.2 Curves	270
AIV.3 Notes and references	275
APPENDIX V. ERRATA FOR <i>Projective geometries over finite fields</i> (OUP, 1979)	276
BIBLIOGRAPHY	279
INDEX OF NOTATION	303
AUTHOR INDEX	309
GENERAL INDEX	311