

Contents

Preface	i
1 Introduction	1
1.1 Factorial Designs and Factorial Effects	1
1.2 Fractional Factorial Designs	4
1.3 Optimality Criteria	9
1.3.1 Maximum Resolution Criterion	9
1.3.2 Minimum Aberration Criterion	10
1.3.3 Clear Effects Criterion	11
1.3.4 Maximum Estimation Capacity Criterion	12
1.4 Organization of the Book	13
2 General Minimum Lower-Order Confounding Criterion for 2^{n-m} Designs	15
2.1 GMC Criterion	15
2.2 Relationship with MA Criterion	20
2.3 Relationship with CE Criterion	23
2.4 Relationship with MEC Criterion	25
Appendix A: GMC 2^{n-m} Designs with $m \leq 4$	26
Appendix B: GMC 2^{n-m} Designs with 16, 32, and 64 Runs	28
3 General Minimum Lower-Order Confounding 2^{n-m} Designs	31
3.1 Some Preparation	31
3.1.1 Several Useful Results	31
3.1.2 Structure of Resolution <i>IV</i> Design with $N/4 + 1 \leq n \leq N/2$	34
3.2 GMC 2^{n-m} Designs with $n \geq 5N/16 + 1$	39
3.2.1 Main Results and Examples	39
3.2.2 Proof of Theorem 3.10	40
3.3 GMC 2^{n-m} Designs with $9N/32 + 1 \leq n \leq 5N/16$	46

3.3.1	Main Results and Example.....	46
3.3.2	Outline of the Proof of Theorem 3.16.....	46
3.4	GMC 2^{n-m} Designs with $N/4 + 1 \leq n \leq 9N/32$	47
3.4.1	Some Properties of MaxC2 2^{n-m} Designs with $n = N/4 + 1$	47
3.4.2	GMC 2^{n-m} Designs with $N/4 + 1 < n \leq 9N/32$	49
3.4.3	Outline of the Proof of Theorem 3.23.....	50
3.5	When Do the MA and GMC Designs Differ?	51
4	General Minimum Lower-Order Confounding Blocked Designs	53
4.1	Two Kinds of Blocking Problems	53
4.2	GMC Criteria for Blocked Designs	54
4.3	Construction of B-GMC Designs	57
4.3.1	B-GMC $2^{n-m} : 2^r$ Designs with $5N/16 + 1 \leq n \leq N/2$	58
4.3.2	B-GMC $2^{n-m} : 2^r$ Designs with $n > N/2$	63
4.3.3	Weak B-GMC $2^{n-m} : 2^r$ Designs.....	67
4.4	Construction of B ¹ -GMC Designs.....	69
4.4.1	B ¹ -GMC $2^{n-m} : 2^r$ Designs with $n \geq 5N/16 + 1$	70
4.4.2	B ¹ -GMC $2^{n-m} : 2^r$ Designs with $9N/32 + 1 \leq n \leq 5N/16$	72
4.4.3	B ¹ -GMC $2^{n-m} : 2^r$ Designs with $N/4 + 1 \leq n \leq 9N/32$	73
4.5	Construction of B ² -GMC Designs	75
4.5.1	B ² -GMC $2^{n-m} : 2^r$ Designs with $n \geq 5N/16 + 1$	76
4.5.2	B ² -GMC $2^{n-m} : 2^r$ Designs with $N/4 + 1 \leq n \leq 5N/16$	78
5	Factor Aliased and Blocked Factor Aliased Effect-Number Patterns	80
5.1	Factor Aliased Effect-Number Pattern of GMC Designs.....	80
5.1.1	Factor Aliased Effect-Number Pattern	80
5.1.2	The F-AENP of GMC Designs	83
5.1.3	Application of the F-AENP.....	87
5.2	Blocked Factor Aliased Effect-Number Pattern of B ¹ -GMC Designs.....	89
5.2.1	Blocked Factor Aliased Effect-Number Pattern	89
5.2.2	The B-F-AENP of B ¹ -GMC Designs.....	92

5.2.3	Applications of the B-F-AENP.....	99
6	General Minimum Lower-Order Confounding Split-plot Designs	102
6.1	Introduction	102
6.2	GMC Criterion for Split-plot Designs.....	103
6.2.1	Comparison with MA-MSA-FFSP Criterion.....	105
6.2.2	Comparison with Clear Effects Criterion.....	110
6.3	WP-GMC Split-plot Designs	111
6.3.1	WP-GMC Criterion for Split-plot Designs.....	111
6.3.2	Construction of WP-GMC Split-plot Designs.....	114
7	Partial Aliased Effect-Number Pattern and Compromise Designs	119
7.1	Introduction	119
7.2	Partial Aliased Effect-Number Pattern.....	121
7.3	Some General Results of Compromise Designs	124
7.4	Class One Compromise Designs.....	126
7.4.1	Largest Class One Clear Compromise Designs and Their Construction.....	126
7.4.2	Supremum $f^*(q, n)$ and Construction of Largest Class One CCDs	127
7.4.3	Supremum $n^*(q, f)$ and Construction of Largest Class One CCDs	130
7.4.4	Largest Class One Strongly Clear Compromise Designs	133
7.4.5	Class One General Optimal Compromise Designs.....	137
7.5	Discussion	141
8	General Minimum Lower-Order Confounding Criteria for Robust Parameter Designs	147
8.1	Introduction	147
8.2	Selection of Optimal Regular Robust Parameter Designs	149
8.3	An Algorithm for Searching Optimal Arrays	155
9	General Minimum Lower-Order Confounding Criterion for s^{n-m} Designs	162

9.1	Introduction to s^{n-m} Designs	162
9.2	GMC Criterion and Relationship with Other Criteria	166
9.3	GMC s^{n-m} Designs Using Complementary Designs	174
9.4	B-GMC Criterion for Blocked s^{n-m} Designs	178
10	General Minimum Lower-Order Confounding Criterion for	
	Orthogonal Arrays	182
10.1	Introduction	182
10.2	ANOVA Models and Confounding Between Effects	183
10.3	Generalized AENP and GMC Criterion	187
10.4	Relationship with Other Criteria	189
10.5	Some G-GMC Designs	193
	References	196
	Index	206