

Table of Contents

Editor's Preface	IX
Preface to the English Edition	XII
Basic Symbols	XIII
CHAPTER I. Introductory Remarks about the Experiment and Its Design	1
CHAPTER II. The Regression Model and Methods of Estimation	15
II.1. Introduction	15
II.2. The Regression Model with Uncorrelated Observations	16
II.3. Estimates of Linear Functionals in the Regression Model	20
II.4. Deviations from the Linear Estimation and from the Definition of the Design	31
II.5. Deviations from the Model of the Experiment	37
II.5.1. The Nonlinear Regression Model	37
II.5.2. The Regression Model with Correlated Observations	39
II.5.3. The Regression Model with Grouped Observations	40
II.5.4. Vaguely Defined Regression Models	41
CHAPTER III. The Ordering of Designs and the Properties of Variances of Estimates	47
III.1. Introduction	47
III.2. The Uniform Ordering of the Set of Designs	48

III.3. Properties of the Function $\mathbf{M}(\xi) \in \mathfrak{M} \rightarrow \text{var}_{\xi} g$	61
III.4. Designs Yielding Small Values of $\text{var}_{\xi} g$	69
 CHAPTER IV. Optimality Criteria in the Regression Model	75
IV.1. Introduction	75
IV.2. Global Optimality Criteria	78
IV.2.1. The D-optimality Criterion	78
IV.2.2. The A-optimality Criterion	82
IV.2.3. The G-optimality Criterion	84
IV.2.4. The Equivalence of D-optimum and G-optimum Designs	88
IV.2.5. The E-optimality Criterion	90
IV.2.6. Linear Optimality Criteria	92
IV.2.7. The L_p -class of Optimality Criteria	94
IV.3. Partial Optimality Criteria	99
IV.4. Properties of Convex Criteria Functions	109
IV.5. Singular ϕ -optimum Designs	122
 CHAPTER V. Iterative Computation of Optimum Designs	128
V.1. Introduction	128
V.2. Computation of a Partial D-optimum Design	129
V.3. The Computation of a D-optimum Design on a Finite Set X	138
V.4. Other Iterative Methods for D-optimality	143
V.4.1. The Steepest Descent Method for Global D-optimality	143
V.4.2. The Accelerated Method of Steepest Descent	144
V.4.3. The Application of the Duality Principle	145
V.5. The Computation of ϕ -optimum Designs for Convex Global Criteria Functions	146
V.6. Other Methods for Computing ϕ -optimum Designs	161
V.6.1. The Steepest Descent Method with a Linear or Quadratic Iteration	161
V.6.2. A Method Based on the Inverse Equivalence Theorem	163
V.6.3. Combined Iterative Methods	165

V.6.4. The Computation of ϕ -optimum Designs under Constraints	166
V.6.5. Complementary Notes	168
CHAPTER VI. Design of Experiments in Particular Cases	170
VI.1. The Regression Model Linear in the Factors	170
VI.2. The Polynomial Regression on the Real Line	176
VI.2.1. The Optimum Interpolation	177
VI.2.2. The Optimum Extrapolation	180
VI.3. The Trigonometric Regression	184
CHAPTER VII. The Functional Model and Measurements of Physical Fields	187
VII.1. Introduction	187
VII.2. Potential Fields and the Functional Model	192
VII.3. Experiments for the Estimation of Linear Functionals	198
VII.4. Experiments for the Estimation of Nonlinear Functionals	207
References	219
Subject Index	227