

CONTENTS

Preface	5
CONDITIONS OF THE PROBLEMS	9
Chapter 1. Introduction. Classification of Partial Differential Equations and Systems of Partial Differential Equations. Normal Form of Partial Differential Equations of the Second Order in Two Independent Variables. Derivation of Some Equations of Mathematical Physics	9
§ 1. Partial Differential Equation and Its Solution. Systems of Partial Differential Equations	9
§ 2. Classification of Partial Differential Equations and Systems of Partial Differential Equations	12
§ 3. Reduction to Normal Form of Linear Partial Differential Equations of the Second Order in Two Independent Variables	17
§ 4. Mathematical Models for Some Phenomena Studied in Mathematical Physics	21
Chapter 2. Elliptic Partial Differential Equations	40
§ 1. Basic Properties of Harmonic Functions	40
§ 2. The Dirichlet and the Neumann Boundary-Value Problems for Harmonic Functions	46
§ 3. Potential Functions	53
§ 4. Some Other Classes of Elliptic Partial Differential Equations	59
Chapter 3. Hyperbolic Partial Differential Equations	65
§ 1. Wave Equation	65
§ 2. Well-Posed Problems for Hyperbolic Partial Differential Equations	75
§ 3. Some Other Classes of Hyperbolic Partial Differential Equations. The Cauchy Problem for Laplace's Equation	82

Chapter 4. Parabolic Partial Differential Equations	93
§ 1. Heat Conduction Equation	93
§ 2. Some Other Examples of Parabolic Partial Differential Equations	97
Chapter 5. Basic Practical Methods for the Solution of Partial Differential Equations	101
§ 1. The Method of Separation of Variables (The Fourier Method)	101
§ 2. Special Functions. Asymptotic Expansions	116
§ 3. Method of Integral Transformations	132
§ 4. Method of Finite Differences	140
§ 5. Variational Methods	144
ANSWERS, HINTS AND SOLUTIONS	149
Appendix	319