
CONTENTS

Chapter I Set theory and Number Theory	1
§1 Set Theory	1
§2 Unique Factorization Theorem	6
§3 Congruence	12
§4 Chinese Remainder Theorem	20
§5 Complex Integers	23
§6 Real Numbers and p -adic Numbers	33
Chapter II Group theory	47
§1 Definitions	47
§2 The Transformation Groups on Sets	55
§3 Subgroups	62
§4 Normal Subgroups and Inner Automorphisms	73
§5 Automorphism Groups	82
§6 p -Groups and Sylow Theorems	85
§7 Jordan-Hölder Theorem	89
§8 Symmetric Group S_n	96
Chapter III Polynomials	102
§1 Fields and Rings	102
§2 Polynomial Rings and Quotient Fields	108
§3 Unique Factorization Theorem for Polynomials	114
§4 Symmetric Polynomial, Resultant and Discriminant	130
§5 Ideals	144
Chapter IV Linear Algebra	160
§1 Vector Spaces	160
§2 Basis and Dimension	165
§3 Linear Transformation and Matrix	181

§4 Module and Module over P.I.D.	196
§5 Jordan Canonical Form	214
§6 Characteristic Polynomial	223
§7 Inner Product and Bilinear form	232
§8 Spectral Theory	243
Chapter V Polynomials in One Variable and Field Theory	252
§1 Algebraically Closed Field	252
§2 Algebraic Extension	257
§3 Algebraic Closure	271
§4 Characteristic and Finite Field	274
§5 Separable Algebraic Extension	282
§6 Galois Theory	291
§7 Solve Equation by Radicals	306
§8 Field Polynomial and Field Discriminant	321
§9 Lüroth's Theorem	326
Appendix	332
A1 Set Theoretical Notations	332
A2 Peano's Axioms	333
A3 Homological Algebra	337
Index	343