

# Table of Contents

	PAGE
<b>Index of Symbols</b>	<b>xv</b>
<b>CHAPTER</b>	
<b>1. Introduction</b>	<b>1</b>
A. Deductive and Inductive Reasoning	1
B. Traditional Deductive Systems	7
C. Modern Systems of Logic and Mathematics	8
D. Axiomatization	15
<b>2. Sets and Syllogisms</b>	<b>17</b>
A. The Set	18
B. Set Notation	18
1. Union and Intersection	19
2. Universal Set	21
3. Negation	21
4. Null Set	22
5. Venn Diagrams	25
a. Shading Method	25
b. Area Numbers	26
c. Elimination Method	30
6. Summary	31
C. The Syllogism	36
1. Kinds of Propositions	36
2. Representation of Propositions by Set Notation	37
3. Rules of Validity	41
a. Traditional Tests for Valid Syllogisms	43
b. Modern Tests for Valid Syllogisms	47
4. Conclusion	55
<b>3. Truth Table Logic</b>	<b>59</b>
A. Sentential Connectives and Truth Tables	60
1. Conjunction	60
2. Disjunction	60
3. Truth Tables	61
4. Implication	63
5. Equivalence	64
6. Negation	65

	PAGE
<b>B. Use of Truth Tables</b>	<b>67</b>
1. Examination of Arguments	67
2. A Set of Useful Tautologies	75
3. Summary	80
<b>C. Logical Deduction</b>	<b>82</b>
1. Examination of Arguments Using Tautologies	83
a. Simple Proofs	83
b. Independence	85
c. Translations from Ordinary Language	86
d. Additional Example	87
2. Argument Form: Implication and Equivalence	88
3. Special Methods	89
a. Conditional Proofs	89
b. Absurdity	92
4. Existential and Universal Quantifiers	97
5. Translations between Existential and Universal Quantifiers	101
6. Logical Deduction Using Quantifiers	104
a. Universal Quantifiers	105
b. Existential Quantifiers	107
7. Relationships between Quantifiers and Traditional Propositions	113
 <b>4. Derivation of Deductive Systems</b>	 116
<b>A. Axiomatization of Arithmetic</b>	<b>117</b>
1. Decimal Number System	117
2. Binary Number System	119
3. Modulo System	120
4. Summary	123
<b>B. Propositional Calculus</b>	<b>123</b>
1. Preliminary Statements	124
a. Primitive Symbols	124
b. Well-formed Formulas	124
c. Definitions	124
d. Rules of Operation	125
e. Assumptions	126
2. Theorems	126
Appendix on Polish Notation	133
3. Summary	134

	PAGE
<b>C. Class Calculus</b>	<b>136</b>
1. Preliminary Statements	136
a. Primitive Symbols	137
b. Well-formed Formulas	137
c. Definitions	137
d. Rules of Operation	137
e. Assumptions or Postulates	138
2. Theorems	139
3. Conclusion	151
<b>5. The Algebra of Electrical Switches</b>	<b>153</b>
A. Algebraic Interpretation	153
B. Matrices	159
C. Simplification of Algebraic Expressions	161
D. Determination of the Algebraic Expression from a Given Characteristic	167
1. Disjunctive Normal Form	167
2. Conjunctive Normal Form	170
E. Translations between the Normal Forms	172
<b>6. Theory and Definitions</b>	<b>176</b>
A. Truth and Validity	176
B. Sentences, Statements, and Propositions	178
C. Probability	183
D. Definitions and Use-Mention	190
E. Conclusion	195
<b>Answers to Exercises</b>	<b>199</b>
<b>Index</b>	<b>229</b>