CONTENTS

1 INTRODUCTION 1

- 1.1 Nature of Statistics 1
- 1.2 History of Statistics 3

2 SETS AND PROBABILITY 5

- 2.1 Sets and Subsets 5
- 2.2 Set Operations 8
- 2.3 Sample Space 11
- 2.4 Counting Sample Points 14
- 2.5 Probability 18
- 2.6 Some Probability Laws 20
- 2.7 Conditional Probability 23
- 2.8 Bayes' Rule 26

3 DISTRIBUTIONS OF RANDOM VARIABLES 35

- 3.1 Concept of a Random Variable 35
- 3.2 Discrete Probability Distributions 37
- 3.3 Continuous Probability Distributions 39
- 3.4 Empirical Distributions 41
- 3.5 Percentiles, Deciles, and Quartiles 46
- 3.6 Joint Probability Distributions 47

4	MA	ATHEMATICAL EXPECTATION 55
	4.1	Summation Notation 55
	4.2	
	4.3	1
	4.4	T T T T T T T T T T T T T T T T T T T
		Properties of the Variance 69
	4.6	
5	so	ME DISCRETE PROBABILITY DISTRIBUTIONS
	5.1	Introduction 77
	5.2	Uniform Distribution 78
	5.3	Binomial Distribution 79
	5.4	Hypergeometric Distribution 86
		Poisson Distribution 92
	5.6	Negative Binomial Distribution 95
6	NO	RMAL DISTRIBUTION 101
	6.1	Normal Curve 101
	6.2	Areas Under the Normal Curve 103
	6.3	Normal Approximation to the Binomial 111
7	SA	MPLING THEORY 121
	7.1	Populations and Samples 121
	7.2	
	7.3	1
	7.4	Sampling Distributions of the Mean 130
	7.5	t 6
		t Distribution 142
		Chi-Square Distribution 145
	7.8	F Distribution 147
8	EST	IMATION THEORY 153
	8.1	Introduction 153
	8.2	Classical Methods of Estimation 154
	8.3	Estimating the Mean 156
	8.4	Estimating the Difference Between Two Means 162
	8.5	Estimating a Proportion 171
	8.6	Estimating the Difference Between Two Proportions 175
	8.7	Estimating the Variance 178

Contents

		Estimating the Ratio of Two Variances 180 Decision Theory 182	
9	TESTS OF HYPOTHESES 191		
	9.3 9.4 9.5 9.6 9.7 9.8 9.9	Type I and Type II Errors 192 One-Tailed and Two-Tailed Tests 200 Tests Concerning Means and Variances 202 Wilcoxon Two-Sample Test 208 Wilcoxon Test for Paired Observations 214 Tests Concerning Proportions 218	
10	REC	RESSION AND CORRELATION 239	
	10.2 10.3 10.4 10.5 10.6	Linear Regression 239 Estimation of Parameters 242 Prediction 249 Test for Linearity of Regression 251 Exponential Regression 253 Multiple Regression 255 Correlation 257	
11	AN.	ALYSIS OF VARIANCE 267	
	11.2 11.3 11.4 11.5 11.6	Introduction 267 One-Way Classification 268 Test for the Equality of Several Variances 275 Multiple-Range Test 277 Two-Way Classification, Single Observation per Cell 279 Two-Way Classification, Several Observations per Cell 286 Brief Discussion of Experimental Designs 293	
	RE	FERENCES 301	
	AP	PENDIX: STATISTICAL TABLES 303	
	AN	SWERS TO EXERCISES 325	
	IND	DEX 335	