

Contents

Preface	(v)
---------------	-----

CHAPTER 1: INTRODUCTION

1.1 Introduction	1
------------------------	---

CHAPTER 2: COLLECTION OF DATA

2.1 Introduction	3
2.1.1 Methods of Collection of Primary Data	3
2.2 Basic Concepts	5
2.2.1 Variable	5
2.2.2 Quantitative Variable	5
2.2.3 Qualitative Variable	5
2.2.4 Discrete Variable	6
2.2.5 Continuous Variable	6
2.2.6 Population	6
2.2.7 Sample	6
2.3 Measurement	6
2.3.1 Nominal Scale	6
2.3.2 Ordinal Scale	7
2.3.3 Interval Scale	7
2.3.4 Ratio Scale	7
2.4 Sampling	7
2.4.1 Simple Random Sampling	7
2.4.2 Non-random Sampling	8
2.4.3 Advantages and Disadvantages of Sampling Techniques	8
2.4.4 Stratified Random Sampling	9
2.4.5 Systematic Sampling	10
2.4.6 Cluster Sampling	11
2.4.7 Purposive Sampling	11
2.4.8 Convenience Sampling	12
2.4.9 Quota Sampling	12
2.4.10 Sampling Errors	13
2.4.11 Non-Sampling Errors	13
2.4.12 Size of the Sample	14
2.4.13 Determination of Sample Size	14

(viii) Contents

CHAPTER 3: DATA ORGANIZATION

3.1	Introduction	16
3.1.1	Inclusive Method of Grouping.....	17
3.1.2	Exclusive Method of Grouping.....	17
3.2	Diagrammatic Representation	18
3.2.1	One-Dimensional Diagram	18
3.2.2	Two-Dimensional Diagrams.....	22
3.3	Three-Dimensional Diagrams.....	24
3.3.1	Cubic Graphs/ Pictograms	24
3.3.2	Counter Plot Graph.....	24
3.3.3	Response Surface Plot	24
	<i>Exercises</i>	25

CHAPTER 4: MEASURES OF CENTRAL TENDENCY AND DISPERSION

4.1	Introduction	28
4.2	Arithmetic Mean.....	28
4.3	Median.....	31
4.4	Mode.....	34
4.5	Measures of Dispersion	36
4.5.1	Range.....	37
4.5.2	Standard Deviation	38
4.5.3	Coefficient of Variation	42
4.5.4	Standard Error of Mean	44
	<i>Exercises</i>	45

CHAPTER 5: SKEWNESS AND KURTOSIS

5.1	Moments	47
5.2	Skewness	48
5.2.1	Pearson's Coefficient of Skewness.....	49
5.2.2	Moment Coefficient of Skewness.....	50
5.3	Kurtosis	50
5.3.1	Platy Kurtic.....	50
5.3.2	Meso Kurtic	50
5.3.3	Lepto Kurtic.....	50
	<i>Exercises</i>	53

CHAPTER 6: PROBABILITY AND DISTRIBUTIONS

6.1	Introduction	54
6.1.1	A Priori Probability	54
6.1.2	A Posteriori Probability	55

6.2 Mutually Exclusive Events	55
6.2.1 Addition Rule	55
6.3 Mutually Independent Events	56
6.3.1 Multiplication Rule	56
6.4 Not Mutually Exclusive Events	57
6.5 Conditional Probability	58
6.5.1 Bayes' Theorem	59
6.6 Binomial Distribution	61
6.6.1 Properties of Binomial Distribution	64
6.6.2 Fitting of the Binomial Distribution	66
6.7 Poisson Distribution	67
6.7.1 Properties	67
6.7.2 Fitting of Poisson Distribution	68
6.8 Normal Distribution	70
6.8.1 Frequency Function	71
6.8.2 Properties	72
6.8.3 Distribution Function	72
6.8.4 Fitting of Normal Distribution	74
<i>Exercises</i>	75

CHAPTER 7: CORRELATION AND REGRESSION

7.1 Correlation	79
7.1.1 Test of Significance	82
7.2 Regression	89
7.2.1 Test of Significance of b'	93
7.3 Regression vs Correlation	94
7.4 Multiple Regression and Correlation	101
7.4.1 Multiple Regression	101
7.5 Multiple Correlation	108
7.5.1 Test of Significance of R^2	109
<i>Exercises</i>	111

CHAPTER 8: TESTS OF HYPOTHESES

8.1 Introduction	113
8.1.1 Null Hypothesis & Alternate Hypothesis	113
8.1.2 Degree of Freedom	113
8.1.3 Level of Significance	114

(x) Contents

8.2	Standard Normal Deviate Tests.....	115
8.2.1	Two-Sample S.N.D Test.....	116
8.2.2	One Sample t-test.....	117
8.3	Two-Sample t – test.....	121
8.3.1	Paired t - Test	124
8.4	S.N.D Test for Proportions	128
8.4.1	One-Sample S.N.D. Test for Proportion.....	128
8.4.2	Two-Sample S.N.D. Test for Proportions.....	129
8.4.3	Two-Sample Test.....	130
	<i>Exercises</i>	131

CHAPTER 9: CHI-SQUARE TEST

9.1	Introduction	133
9.2	Chi-Square Distribution.....	133
9.2.1	Properties	134
9.2.2	Chi-Square Test for Goodness of Fit	134
9.3	Chi-Square Test of Independence.....	136
9.3.1	Two \times Two Contingency Table	136
9.3.2	Yates' Correction for Continuity	138
9.3.3	$m \times n$ Contingency Table	141
9.4	Chi-Square Test for Genetic Problems	142
9.5	Chi-Square Test for Homogeneity	143
	<i>Exercises</i>	144

CHAPTER 10: ANALYSIS OF VARIANCE

10.1	Introduction	147
10.1.1	Randomization	148
10.1.2	Replication	148
10.1.3	Local Control	148
10.2	One-Way Analysis of Variance.....	148
10.3	Two-Way Analysis of Variance	156
	<i>Exercises</i>	163

CHAPTER 11: EXPERIMENTAL DESIGNS

11.1	Introduction	166
11.2	Completely Randomized Design	166
11.2.1	Advantages	170
11.2.2	Disadvantages	171

11.3	Randomized Block Design	171
	11.3.1 Introduction	171
	11.3.2 Advantages	176
	11.3.3 Disadvantages	176
	11.3.4 Missing Plot Technique	177
11.4	Latin Square Design	180
	11.4.1 Advantages	183
	11.4.2 Disadvantages	183
11.5	Factorial Experiments.....	190
	11.5.1 2 ² Experiment	190
	11.5.2 Even Vs Odd Rule	193
	11.5.3 2 ³ Experiment	193
	11.5.4 3 ⁿ Factorial Experiment	198
	11.5.5 2 ³ Confounding.....	198
	11.5.6 2 ³ Partial Confounding	200
	11.5.7 2 ⁴ Partial Confounding	201
11.6	Response Surface.....	201

CHAPTER 12: NON-PARAMETRIC STATISTICS

12.1	Wilcoxon Test	208
12.2	Two Independent Samples Test (Mann-Whitney Test)	214
12.3	Test of P-related Samples (Friedman’s Test)	220
12.4	Test of P-independent Samples (Kruskal-Wallis Test).....	224
12.5	Coefficient of Concordance.....	228

CHAPTER 13: RESEARCH METHODOLOGY

13.1	Steps of Scientific Research	231
	13.1.1 Classification of Research	231
13.2	Quantitative Approaches	232
	13.2.1 Casual –Comparative Research	232
	13.2.2 Experimental Research	232
13.3	Qualitative Approaches	232
	13.3.1 Narrative Research	233
	13.3.2 Ethnographic Research	233
	13.3.3 Historical Design/Research	233
13.5	Guidelines for Selecting a Research Method.....	234
	13.5.1 Limitations of the Scientific Method	234
13.6	Selecting a Research Problem	235
	13.6.1 Characteristics of Good Research Topic.....	235
	13.6.2 Stating the Research Problem.....	235

(xii) Contents

13.6.3	Review of Literature.....	236
13.6.4	Guidelines for Reviewing.....	236
13.6.5	Abstracting Information.....	237
13.6.6	Guidelines for Review of Literature.....	237
13.6.7	Formulating and Stating a Hypothesis.....	238
13.6.8	Research Plan and its Purpose.....	239
13.7	Components of Quantitative Research Plan.....	240
13.8	Components of Qualitative Research Plan.....	241
13.8.1	Quantitative Research Sampling.....	243
13.8.2	Qualitative Sampling.....	243
13.8.3	Data Collection Methods - Measuring Variables.....	245
13.8.4	Characteristics / Criteria of a Good Measuring Instrument.....	247
13.8.5	Reliability.....	249
13.9	Techniques of Data Collection.....	251
13.9.1	Interview Technique.....	251
13.9.2	Types of Interviews.....	252
13.9.3	Interview Schedule.....	252
13.9.4	Questionnaire Technique.....	252
13.9.5	Mailed Questionnaires.....	253
13.9.6	Observation Technique.....	253
13.9.7	Sociometry.....	255
13.10	Research Designs.....	256
13.10.1	Expost Facto Designs.....	256
13.10.2	Experimental Designs.....	257
13.10.3	Field Experiments.....	258
13.11	Research Procedures for Different Methods of Research.....	259
13.11.1	Quantitative Researches.....	259
13.11.2	Descriptive Research.....	259
13.11.3	Analyzing Results.....	260
	Appendix.....	263
	References.....	269
	Index.....	271