9. STATISTICS

Scheme:	Duration	Max Marks		Min. Pass Marks	
		Sc.	Arts	Sc.	Arts
Paper- I	3 hrs.	50	65	18	24
Paper-II	3 hrs.	50	65	18	24
Practical	3 hrs.	50	70	18	25
Total		150	200	54	72

Note : In each question paper, 10 (ten) questions will be set having 2 (two) from each unit. Candidates have to answer five questions in all, taking not more than one from each unit.

Paper- I Probability Theory

Unit I. Important concepts of Probability: Random experiment: Trial, Events and their types. Definitions of probability. Sample point and sample space. Axiomatic Approach of Probability and its properties. Addition and Multiplication theorems of probability. Conditional Probability. Bayes Theorem and its Applications (Simple Problems Only). **18 hours**

Unit II. Random Variable: Definition with illustrations, Types of Random Variables. Probability Mass Function, Probability Density Function. Distribution Function and its properties. Joint Probability Distribution, Marginal and Conditional Probability Distributions and density functions (Continuous and Discrete Cases). Chebychev's Inequality and its applications. **18 hours**

Unit III. Mathematical Expectation: Expectation of a random variable and its simple properties. Addition and Multiplication Theorems of Expectation. Conditional Expectation. Definition of Variance and Covariance and properties. Raw and Central Moments, Moment Generating Function and their properties. **18 hours**

Unit IV. Univariate Discrete Distributions and their proper- Bernoulli Distribution, Binomial Distribution, Poisson Distribu Geometric Distribution. Idea of Hyper-geometric and Negative mial Distribution.

Unit V. Univariate Continuous Distributions and their Properties : Rectangular Distribution, Normal Distribution Idea of Exponential Distribution, Cauchy Distribution, Gamma Distribution, Beta Distribution.   18 hours

References

1. Bhatt, B. R. Srivenkatramana, T and Rao Madhava K.S. (1997) : Statistics : A Beginner's Text, Vol. II, New Age International (P) Ltd., New Delhi.

2. Goon A.N., Gupta M.K., Das Gupta B. (1991) : Fundamentals of Statistics, Vol. I & II, World Press, Calcutta.

3. Kapoor V.K. & Gupta S.C. : Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi.

4. Mood A.M., Graybill F.A. and Boes D.C. (1974) : Introduction to the Theory of Statistic, McGraw Hill.

Additional References

1. Hoel P.F. (1971) : Introduction to Mathematical Statistics, Asia Publishing House.

2. David, S (1996) : Elementary Probability, Oxford Press.

3. Cooke, Cramer and Clarke : Basic Statistical Computing, Chapman and Hall.

4. Meyer P.L (1970) : Introductory Probability and Statistical Applications. Addison Wesley

Paper II : Descriptive Statistics :

Unit I. Types and Presentation of Data : Concepts of a statistical population and data. Qualitative and Quantitative data; discrete and continuous data; frequency and non-frequency data. Geographical & Chronological Data. Primary Data and Secondary Data. Tabular presentation of data-Construction of tables, Types of tables. Frequency distribution - Discrete, grouped, continuous and cummulative. Graphical preentation of data-Histogram, frequency polygon, frequency curve and ogives.   18 hours

Unit II. Statistical analysis of Quantitative Data : Different types of scales-nominal, ordinal, intervals and ratio, Univariate Data-Measures of central tendency, dispersion, moments and its cummulation

from data. Absolute and relative measures of skewness and kurtosis based on quantiles and moments. Sheppard's Correction for moments (without Proof). **18 hours**

Unit III. **Curve fitting and Theory of Attributes :** Principle of least squares, fitting of straight line, parabola and curves reducible to straight line (exponential and power curve). Class frequency, order of a class frequency, ultimate class frequency, consistency of data, independence and association of attributes. Various measures of association. **18 hours**

Unit IV. **Statistical Analysis of Bivariate Data :** Correlation analysis-scatter diagram, Karl-Pearson's coefficient of correlation and its properties. Correlation of bivariate frequency distribution, Spearman rank correlation. Regression analysis-Fitting of regression lines, regression coefficients and their properties. **18 hours**

Unit V. **Finite Differences :** Operators E, Δ, ∇, their relationship and properties, factorial notation. Difference table and fundamental theorem of finite differences. Estimation of one and two missing terms, meaning of interpolation and extrapolation. Newton's forward and backward formulae for equal intervals, Lagrange's Formula and numerical problems. **18 hours**

References

1. Bhatt B.R. Srivenkatramanna T and Rao Madhava K.S. (1997) : Statistics : A Beginner's Text, Vol. II, New Age International (P) Ltd., New Delhi.

2. Croxton F.E., Cowden D.J. and Kelin S (1973) : Applied General Statistics, Prentice Hall of India, New Delhi.

3. Goon A.M., Gupta M.K., Das Gupta B. (1991) : Fundamentals of Statistics, Vol. I & II, World Press, Calcutta.

4. Kapoor V.K & Gupta S.C. : Fundamentals of Mathematical Statistics, Sultan Chand and Sons, N. Delhi.

5. Gupta S.P. Statistical Methods. Sultan Chand and Sons, N. Delhi.

6. Elhance D.N. Fundamentals of Statistics

7. Nagar K.N. : Sankhyaki Ke Mool Tatva (Hindi), Minakshi Prakashan Mandir, Merrut.

8. Johnson R.A. : Miller and Freund's Probability and Statistics for Engineers. PHI.

9. Saxena H.C. : Finite Differences and Numerical Analysis. S. Chand & Co.

Additional References

1. Anderson T.W. and Sclove S.L. (1978) : An Introduction to the Statistical Analysis of Data. Houghton Miffin Co.

2. Mood A.M. Graybill F.A. and Boes D.C. (1974) : Introduction to the Theory of Statistics, McGraw Hill.

3. Spiegel M.R. (1967) : Theory & Problems of Statistics, Schaum's Publishing Series.

Paper III. Practical Paper :

1. Exercise on mathematical expectations and finding Mean, Variance, Skewness and kurtosis of Univariate probability distributions.

2. Fitting standard univariate discrete and continuous probability distributions.

3. Computation for marginal and Conditional Distributions.

4. Presentation of data through Frequency Table, and Graphs.

5. Calculation of Measures of Central tendency, Dispersion, Moments and Skewness and Kurtosis.

6. Computation of Correlation Coefficient of bivariate data and bivariate frequency distribution table.

7. Regression of two variables.

8. Fitting of curves by the least square method.

9. Computation of Spearman's rank correlation.

10. Construction of Difference table.

11 Interpolation Problems based on Newton and Langrange's Formulas.