

GENERAL

101 Descriptive Statistics I

Types of statistical data, Compilation, Classification, Tabulation and Diagrammatic representation of data, Frequency Distribution, Cumulative Distribution and their graphical representation, Histogram, Frequency Polygon, Frequency Curve and Ogive. (11L)

Analysis of Univariate Quantitative Data – concepts of central tendency, dispersion, relative dispersion, skewness and kurtosis and their measures based on quantiles and moments. (14L)

References:

1. Goon A.M., Gupta M. & Dasgupta B.(2001) : Fundamentals of Statistics (Vol. 1), World Press
2. Yule G.U. & Kendall M.G.(1950) : Introduction to the Theory of Statistics, Charles Griffin
3. Nagar A.L. & Das R.K. (1976): Basic Statistics
4. Bhattacharyya G. K. & Johnson R. A. (1977) : Concepts & Methods of Statistics, J.Wiley

102 Probability I

Random Experiments and Random Events, Statistical regularity and meaning of Probability, Classical and Axiomatic definitions of Probability (discrete sample space only), Conditional Probability, Independence of Events, Principal Theorems including union and intersection of events and Bayes Theorem. (13L)

Random Variable and its Probability Distribution, Cumulative Distribution Function, Probability Mass Function and Probability Density Function, Mathematical Expectation, Variance and Moments. Joint Distribution of two random variables, Marginal and Conditional distributions, Covariance and Correlation, Simple Theorems including theorems on expectation and variance of a sum of random variables and expectation of product of random variables. (12L)

References:

1. Goon A.M., Gupta M. & Dasgupta B.(1997): An Outline of Statistics(Vol 1), World Press
2. Feller W.(1968) : An Introduction to Probability Theory & its Applications, John Wiley
3. Cacoullos T. (1973): Exercises in Probability, Narosa
4. Bhattacharyya G. K. & Johnson R. A. (1977) : Concepts & Methods of Statistics, J.Wiley
5. Freund J.E. (2001): Mathematical Statistics, Prentice Hall
6. Pitman J. (1993): Probability, Narosa
7. Stirzaker D. (1994): Elementary Probability, Cambridge University Press
8. Rathie and Mathai: Probability and Statistics

201 Descriptive Statistics II

Fitting of Binomial, Poisson and Normal distributions (2L)

Analysis of Bivariate Quantitative Data – Scatter Diagram, Product Moment Correlation Coefficient and its properties, Regression Analysis, Fitting of Linear and Polynomial equations by the principle of Least Squares, Correlation Index, Spearman's Rank Correlation Coefficient. (15L)

Analysis of Multivariate Quantitative Data – Multiple Regression, Multiple Correlation and Partial Correlation in *three* variables, their measures and related results. (8L)

References:

1. Goon A.M., Gupta M. & Dasgupta B.(2001) : Fundamentals of Statistics (Vol. 1), World Press
2. Yule G.U. & Kendall M.G.(1950) : Introduction to the Theory of Statistics, Charles Griffin
3. Nagar A.L. & Das R.K. (1976): Basic Statistics
4. Bhattacharyya G. K. & Johnson R. A. (1977) : Concepts & Methods of Statistics, J.Wiley

202 Probability II

Standard Univariate Discrete Distributions and their properties – Discrete Uniform, Binomial, Poisson, Hypergeometric, Geometric and Negative Binomial distributions (10L)

Standard Univariate Continuous Distributions – Uniform, Normal, Exponential, Gamma, Beta and Lognormal distributions, Bivariate Normal distribution and statement of its general properties (10L)

Chebychev's Inequality, Weak Law of Large Numbers, Statement of Central Limit Theorem (i.i.d. case) and its uses. (5L)

References:

1. Goon A.M., Gupta M. & Dasgupta B.(1997): An Outline of Statistics(Vol 1), World Press
2. Feller W.(1968) : An Introduction to Probability Theory & its Applications, John Wiley
3. Cacoullos T. (1973): Exercises in Probability, Narosa
4. Bhattacharyya G. K. & Johnson R. A. (1977) : Concepts & Methods of Statistics, J.Wiley
5. Freund J.E. (2001): Mathematical Statistics, Prentice Hall
6. Pitman J. (1993): Probability, Narosa
7. Stirzaker D. (1994): Elementary Probability, Cambridge University Press
8. Rathie and Mathai: Probability and Statistics

301 Sampling Distributions and Point Estimation

Concepts of Population and sample, Random Sampling and Sampling Distributions of Statistics, sampling distribution of sum of independent Binomial and Poisson variables, χ^2 , t and F distributions (derivations excluded), sampling distribution of mean and variance of independent Normal variables.

(13L)

Point Estimation of a population parameter – concepts of Bias and Standard Error of an estimator, concepts of Unbiasedness, Minimum Variance, Consistency and Efficiency of an estimator, Method of Moments, Maximum Likelihood Method of estimation, Method of Least Squares, Point estimators of the parameters of Binomial, Poisson, and univariate Normal distributions.

(12L)

References:

1. Goon A.M., Gupta M. & Dasgupta B.(1997) : An Outline of Statistics (Vol 1), World Press
2. Goon A.M.,Gupta M.& Dasgupta B.(2001): Fundamentals of Statistics (Vol 1), World Press
3. Mood A.M., Graybill F. & Boes D.C.(1974) : An Introduction to the theory of Statistics (3rd ed.), McGraw Hill
4. Rohatgi V.K. (1984): An Introduction to Probability Theory and Mathematical Statistics, John Wiley
5. Goon A.M.,Gupta M.& Dasgupta B.(2001): Fundamentals of Statistics (Vol 1), World Press

302 Economic Statistics, Time Series Analysis

Economic Statistics: Index Number –construction and use of price index numbers and tests in connection with them, Consumer and Wholesale price index numbers, their uses and major steps in their construction.

(12L)

Time Series Analysis: Different components of a times series, determination of Trend by method of simple moving-averages and by fitting mathematical curves by least squares principle, determination of seasonal indices by methods of trend ratios and ratios to moving averages.

(13L)

References:

1. Goon A.M.,Gupta M.& Dasgupta B.(2001): Fundamentals of Statistics (Vol 2), World Press
2. Yule G.U.& Kendall M.G.(1950) : Introduction to the Theory of Statistics, Charles Griffin
3. Nagar A.L. & Das R.K. (1976): Basic Statistics
4. Mukhopadhyay P. (1999): Applied Statistics
5. Croxton F. E., Cowden D. J. & Klein (1969) : Applied General Statistics, Prentice Hall

401 Statistical Inference

Statistical tests of Hypotheses – Null and Alternative hypotheses, Types of Errors, Critical Region, Level of Significance, Power and p-values, Exact tests of hypotheses under Normal set-up for a single mean, the equality of two means, a single variance and the equality of two variances, Test of Significance of sample correlation coefficient (null case) and tests of hypotheses for the equality of means and equality of variances of a bivariate Normal distribution. (13L)

Interval Estimation – Confidence Interval and Confidence Coefficient, Exact confidence interval under Normal set-up for a single mean, single variance, the difference of two means and the ratio of two variances. (5L)

Large Sample Tests and related Interval Estimates of a single mean and a single proportion and difference of two means & two proportions, Pearsonian χ^2 tests for goodness of fit & for homogeneity and independence in a contingency table. (7L)

References:

1. Goon A.M., Gupta M. & Dasgupta B.(1997) : An Outline of Statistics (Vol 1), World Press
2. Goon A.M.,Gupta M.& Dasgupta B.(2001): Fundamentals of Statistics (Vol 1), World Press
3. Mood A.M., Graybill F. & Boes D.C.(1974) : An Introduction to the theory of Statistics (3rd ed.), McGraw Hill
4. Rohatgi V.K. (1984): An Introduction to Probability Theory and Mathematical Statistics, John Wiley
5. Goon A.M.,Gupta M.& Dasgupta B.(2001): Fundamentals of Statistics (Vol 1), World Press

402 Population Statistics and Statistical Quality Control

Population Statistics:

Vital events, Rates and Ratios, Measurement of Mortality – Crude, Specific and Standardized death rates, Complete Life Table, Measurement of Fertility and Reproduction – Crude Birth Rate, General, Specific and Total fertility rates, Gross and Net reproduction rates. (14L)

Statistical Quality Control:

Advantages of statistical quality control, Construction of control charts by attributes (p, c, np) and variables (\bar{x} , R). (7L)

Sampling Inspection Plan by attributes, OC, ASN (and ATI), LTPD and AOQL for single sampling plan (4L)

References:

1. Goon A.M.,Gupta M.& Dasgupta B.(2001): Fundamentals of Statistics (Vol 2), World Press
2. Yule G.U.& Kendall M.G.(1950) : Introduction to the Theory of Statistics, Charles Griffin
3. Nagar A.L. & Das R.K. (1976): Basic Statistics
4. Mukhopadhyay P. (1999): Applied Statistics
5. Croxton F. E., Cowden D. J. & Klein (1969) : Applied General Statistics, Prentice Hall

501 Sample Survey Methods:

Concepts of population and sample, Need for sampling, Stages in the design and conduct of sample surveys. Concept of probability sampling, Random Number tables. Simple random sampling with and without replacement (8L)

Stratified random sampling – associated unbiased estimators of population mean, total and proportion, their variances and unbiased variance estimators, Linear Systematic sampling, Two-stage sampling (with primary units of equal size and equal selection probability at each stage) – unbiased estimation of population mean and total. (17L)

References:

1. Goon A.M., Gupta M. & Dasgupta B. (2001): Fundamentals of Statistics (Vol 2), World Press
2. Cochran W.G. (1984): Sampling Techniques (3rd ed.), Wiley Eastern
3. Nagar A.L. & Das R.K. (1976): Basic Statistics
4. Mukhopadhyay P. (1999): Applied Statistics

601 Design & Analysis of Experiments

Analysis of Variance in one-way classified data and two-way classified data with equal number of observations in each cell. (10L)

Basic principles of design – Randomization, Replication and Local Control, Completely Randomized design, Randomized Block design and Latin Square design, applications of the technique of Analysis of Variance for the analysis of data collected under these designs. (15L)

References:

1. Goon A.M., Gupta M. & Dasgupta B. (2001): Fundamentals of Statistics (Vol 2), World Press
2. Kempthorne O. (1965): The Design & Analysis of Experiments, Wiley Eastern
3. Nagar A.L. & Das R.K. (1976): Basic Statistics
4. Mukhopadhyay P. (1999): Applied Statistics

Question Pattern for B.Sc. Honours Examinations in Statistics (1+1+1) - 2010

Theoretical

Part I

Paper IA:

- Short Questions of 5 marks each: No. of questions to be given = 8
No. of questions to be answered = 4
Total marks = $5 \times 4 = 20$
- Broad Questions of 15 marks each: No. of questions to be given = 4
No. of questions to be answered = 2
Total marks = $15 \times 2 = 30$

Paper IB:

- Short Questions of 5 marks each: No. of questions to be given = 8
No. of questions to be answered = 4
Total marks = $5 \times 4 = 20$
- Broad Questions of 15 marks each: No. of questions to be given = 4
No. of questions to be answered = 2
Total marks = $15 \times 2 = 30$

Paper IIA:

Group A (25 marks)

- Short Questions of 5 marks each: No. of questions to be given = 4
No. of questions to be answered = 2
Total marks = $5 \times 2 = 10$
- Broad Questions of 15 marks each: No. of questions to be given = 2
No. of questions to be answered = 1
Total marks = $15 \times 1 = 15$

Group B (25 marks)

- Short Questions of 5 marks each: No. of questions to be given = 4
No. of questions to be answered = 2
Total marks = $5 \times 2 = 10$
- Broad Questions of 15 marks each: No. of questions to be given = 2
No. of questions to be answered = 1
Total marks = $15 \times 1 = 15$

Part II

Paper IIIA:

Group A (25 marks)

- Short Questions of 5 marks each: No. of questions to be given = 4
No. of questions to be answered = 2
Total marks = $5 \times 2 = 10$
- Broad Questions of 15 marks each: No. of questions to be given = 2
No. of questions to be answered = 1
Total marks = $15 \times 1 = 15$

Group B (25 marks)

- Short Questions of 5 marks each: No. of questions to be given = 4
No. of questions to be answered = 2
Total marks = $5 \times 2 = 10$
- Broad Questions of 15 marks each: No. of questions to be given = 2
No. of questions to be answered = 1
Total marks = $15 \times 1 = 15$

Paper IIIB:

Group A (25 marks)

- Short Questions of 5 marks each: No. of questions to be given = 4
No. of questions to be answered = 2
Total marks = $5 \times 2 = 10$
- Broad Questions of 15 marks each: No. of questions to be given = 2
No. of questions to be answered = 1
Total marks = $15 \times 1 = 15$

Group B (25 marks)

- Short Questions of 5 marks each: No. of questions to be given = 4
No. of questions to be answered = 2
Total marks = $5 \times 2 = 10$
- Broad Questions of 15 marks each: No. of questions to be given = 2
No. of questions to be answered = 1
Total marks = $15 \times 1 = 15$

Paper IVA:

Group A (25 marks)

- Short Questions of 5 marks each: No. of questions to be given = 4
No. of questions to be answered = 2
Total marks = $5 \times 2 = 10$
- Broad Questions of 15 marks each: No. of questions to be given = 2
No. of questions to be answered = 1
Total marks = $15 \times 1 = 15$

Group B (25 marks)

- Short Questions of 5 marks each: No. of questions to be given = 4
No. of questions to be answered = 2
Total marks = $5 \times 2 = 10$
- Broad Questions of 15 marks each: No. of questions to be given = 2
No. of questions to be answered = 1
Total marks = $15 \times 1 = 15$

Part III

Paper VA:

Group A (25 marks)

- Short Questions of 5 marks each: No. of questions to be given = 4
No. of questions to be answered = 2
Total marks = $5 \times 2 = 10$
- Broad Questions of 15 marks each: No. of questions to be given = 2
No. of questions to be answered = 1
Total marks = $15 \times 1 = 15$

Group B (25 marks)

- Short Questions of 5 marks each: No. of questions to be given = 4
No. of questions to be answered = 2
Total marks = $5 \times 2 = 10$
- Broad Questions of 15 marks each: No. of questions to be given = 2
No. of questions to be answered = 1
Total marks = $15 \times 1 = 15$

Paper VB:

- Short Questions of 5 marks each: No. of questions to be given = 8
No. of questions to be answered = 4
Total marks = $5 \times 4 = 20$
- Broad Questions of 15 marks each: No. of questions to be given = 4
No. of questions to be answered = 2
Total marks = $15 \times 2 = 30$

Paper VIA:

- Short Questions of 5 marks each: No. of questions to be given = 8
No. of questions to be answered = 4
Total marks = $5 \times 4 = 20$
- Broad Questions of 15 marks each: No. of questions to be given = 4
No. of questions to be answered = 2
Total marks = $15 \times 2 = 30$

Paper VIB:

Group A (25 marks)

- Short Questions of 5 marks each: No. of questions to be given = 4
No. of questions to be answered = 2
Total marks = $5 \times 2 = 10$
- Broad Questions of 15 marks each: No. of questions to be given = 2
No. of questions to be answered = 1
Total marks = $15 \times 1 = 15$

Group B (25 marks)

- Short Questions of 5 marks each: No. of questions to be given = 4
No. of questions to be answered = 2
Total marks = $5 \times 2 = 10$
- Broad Questions of 15 marks each: No. of questions to be given = 2
No. of questions to be answered = 1
Total marks = $15 \times 1 = 15$

Note:

1. There will be no choices among questions in the Practical Papers. The candidates will be required to answer all the questions.
2. The practical examination of Paper IIB in Part 1, Paper IVB in Part 2 and Papers VIIA and VIIB in Part 3 will be held simultaneously in all the centers on the basis of single question paper in respective papers. Papers VIIIA and VIIB in Part 3 may be held in groups on different dates. However, the final modality will be decided in the UG Board of Studies meeting.
3. The division of marks for each subsection of all the questions in the Theoretical papers is to be given alongside. No such division need to be given for the questions in the Practical papers.

Question Pattern for B.Sc. General Examinations in Statistics (1+1+1) - 2010

Theoretical

Part I

Paper IA:

- Short Questions of 2 marks each: No. of questions to be given = 8
No. of questions to be answered = 4
Total marks = $2 \times 4 = 8$
- Broad Questions of 14 marks each: No. of questions to be given = 6
No. of questions to be answered = 3
Total marks = $14 \times 3 = 42$

Paper IB:

- Short Questions of 2 marks each: No. of questions to be given = 8
No. of questions to be answered = 4
Total marks = $2 \times 4 = 8$
- Broad Questions of 14 marks each: No. of questions to be given = 6
No. of questions to be answered = 3
Total marks = $14 \times 3 = 42$

Part II

Paper IIB:

- Short Questions of 2 marks each: No. of questions to be given = 8
No. of questions to be answered = 4
Total marks = $2 \times 4 = 8$
- Broad Questions of 14 marks each: No. of questions to be given = 6
No. of questions to be answered = 3
Total marks = $14 \times 3 = 42$

Paper IIIA:

- Short Questions of 2 marks each: No. of questions to be given = 8
No. of questions to be answered = 4
Total marks = $2 \times 4 = 8$
- Broad Questions of 14 marks each: No. of questions to be given = 6
No. of questions to be answered = 3
Total marks = $14 \times 3 = 42$

Part III

Paper IVA:

- Short Questions of 2 marks each: No. of questions to be given = 8
No. of questions to be answered = 4
Total marks = $2 \times 4 = 8$
- Broad Questions of 14 marks each: No. of questions to be given = 6
No. of questions to be answered = 3
Total marks = $14 \times 3 = 42$

Note:

1. There will be no choices among questions in the Practical Papers. The candidates will be required to answer all the questions.
2. The division of marks for each subsection of all the questions in the Theoretical papers is to be given alongside. No such division need to be given for the questions in the Practical papers.