STATISTICS (STAT)

Class - XII

Full Marks - 100

THEORY (Full Marks—70)

Descriptive Statistics

Bivariate data-scatter diagram. Two-way Frequency Distribution, Marginal and Conditional Distributions. Simple Correlation Coefficient and its properties.

Simple Regression Analysis and Least Square Method.

Rank data and Rank Correlation. (Spearman's Rank Correlation Coefficient—case of no tie).

Probability Distributions

Random Variables and its Probability Distribution. Cumulative Distribution Function, Probability Mass Function, Probability Density Function. Expectation, Variance.

Joint Probability Distribution of two random variables (discrete case**).**

Maximum and Minimum of a Function. Standard definition of Gamma integral and result involving Gamma (1/2) without derivations.

Binomial distribution, Poisson distribution and Normal distribution and their properties. Problem Sums;

Fitting of above distributions, Concept of goodness-of-fit using Frequency ς^2 approach.

Notion of Uniform distribution.

Scaling Methods: Z Scaling and Percentile scaling.

Sampling and Inference

Sampling Theory and Sampling Distribution:

Population and Sample, Parameter and Statistic. Need for Sampling, Complete Enumeration and Sample Surveys. Basic principles of sample survey. Advantages of Sample Survey over Complete Enumeration. Concept of Probability Sampling. Practical methods of drawing a random sample using a Random Number Table. Uses of Random Number Table.

Simple Random Sampling with and without replacement.

Concept of Sampling distribution of sample mean and its standard error.

Basic Concepts of Inference:

Estimation:
Idea of Inference: Point Estimation, Interval Estimation and Testing of Hypothesis. Estimator and Estimate. Criterion of a good Estimator. Concept of bias. Idea of Unbiasedness and Minimum Variance Unbiasedness.Point Estimation of Binomial proportion, Poisson mean, Normal mean and variance (using method of moments.)

Testing of Hypothesis:

Statistical tests of Hypothesis – Null and Alternative Hypothesis. Simple and Composite Hypothesis. Types I and Type II Error. Critical Region. Level of Significance. Power. One Sided and Two Sided test, Critical Value.

Tests of Significance related to a single Binomial proportion and Poisson mean (using large sample approximations), Mean and variance of a single univariate Normal distribution.

Application of Statistics II [10M]

Time Series Analysis:

Introduction. Different Components of a Time Series. Determination of Trend by method of simple moving-averages and by fitting Mathematical curves (straight line and exponential curve) using Least Square principle.

Statistical Quality Control:

Introduction. Idea of Quality and Quality Control. Advantages of Statistical Quality Control. Process Control and Lot Control. Control Chart Technique. Construction of Control Charts by variables (X, R) and Attributes (p, np).

CLASS - XII

PRACTICAL Full Marks—30

(Problems: 18, Laboratory Note Book: 4, Project work: 5, Viva-Voce: 3)

List of Problem Sets

1. Scatter Diagram, Correlation Coefficient and Regression (ungrouped data only).

2. Spearman's Rank Correlation coefficient (case of no tie).

3. Applications and Fitting of Binomial Distribution, Poisson Distribution and only applications of Normal Distribution. (Fitting of Normal Distribution is excluded)

4. Drawing of Random samples (SRSWR and SRSWOR) –using Random Number Tables.

5. Sampling distribution of Sample Mean from a finite population based on simple random sampling with/without replacement. [Start with a population having finite number of values; choose a sample size (2,3 etc.), list all possible samples of the chosen size, calculate sample mean based on each such sample, obtain the frequency distribution of the sample mean and display diagrammatically.

6. Estimation of Population Mean and estimation of Standard Error (under SRSWR and SRSWOR).

7. Testing of Hypothesis in case of Binomial proportion, Poisson parameter, mean & variance of Normal distribution.

8. Determination of Trend (Moving Average Method, Straight Line and Exponential Curve by Least Square Method.)

9. Construction of Control Chart: p, np, X, R.

10. PROJECT WORK

    It will be based on Collection and Analysis of Data. The analysis should be from any one of the following topics;

    (a) Correlation and Regression including Rank Correlation.

    (b) Trend Determination

    (c) Estimation of Population Mean and Standard Error in case of SRSWR, SRSWOR.

INSTRUCTIONS for Laboratory Session and Preparation of laboratory Note Book.

1. For Laboratory Note Book, square sheets and white sheets both are to be used by the students. But if the square sheets are not available then the students may use Laboratory Note book as used in practical in Biological Sciences, Physics, and Chemistry etc.

2. Strictly, HB pencil is to be used in Laboratory sessions. Scientific calculators may be used. Statistical tables if required are to be supplied by the institutions. Geometry Box may also be used.

3. A problem set on a specific topic covering different numerical problems based on secondary data is to be supplied to the students in a laboratory session. This may be typed or printed or neatly hand-written in white papers.

    Each problem set should carry at the top

    (a) The Problem Set Number.

    (b) Heading (in capital letters).

    (c) Working Date.

4. While solving any problem in any of the problem sets, students must mention the relevant formula with description of notations and theory, in brief if required, in the white papers or in the white side of the inter-leaf sheet. No derivation or discussion is needed.

5. The necessary calculations are to be shown step wise with specification of units, wherever required. Workings should be presented in a neat form through tables etc. whenever required, in the square sheet or in the ruled side of the inter-leaf sheet.

6. For graphs and diagrams the c.m. / m.m. graph paper of appropriate size that suits the practical note book are to be used. Both the axes should be labeled, scales to be mentioned and name of the chart (diagram) is to be mentioned clearly. The graph sheets are to be presented adjacent to the relevant workings of the problem concerned.

7. All the Problem sets enlisted in the syllabus must be completed, examined and signed with date by the teacher concerned. Finally it should be arranged serially, according to the content index.

8. There should be a content Index at the very beginning of the Laboratory Note Book consisting of
    (a)   Serial Number
    (b)   Heading of Problem Set
    (c)   Working Date and
    (d)   Page Number.

RULES for the Practical Examination

1. **The Practical Examination is to be held on a single day simultaneously in all the institutions.**

2. If it is not possible to hold the examination on a same day then there should be **at least three** sets of questions since it is a problem based Practical.

3. The Practical Examination will be of two hours duration including Viva-Voce.

4. Questions of Viva-Voce may be asked by the **External Examiner** to test the depth of understanding in both theory and practical, preferably on Project Work.

5. Only scientific calculators are allowed.

6. Statistical table will not be given in the question paper. If required, it will be supplied by the institution.

7. The completed Laboratory Note Book covering all the topics as prescribed in the syllabus must be submitted during the examination.