STATISTICS

NOTE: Students will be asked to attempt FIVE questions of equal marks including acompulsory question comprising of parts with short answers from the whole syllabi and another four question for the remaining questions.

B.A. / B.Sc. (For 3rd Year)

Paper-I	**38 marks**
Paper-II	**37 marks**
Practical	**25 marks**

B.A. / B.Sc. (For 4th Year)

Paper-III	**38 marks**
Paper-IV	**37 marks**
Practical	**25 marks**

OUTLINE OF THE SYLLABUS

PAPER-I

1. **Descriptive Statistics 1/7**

Definition of statistics, meaning of descriptive and inferential statistics, population and sample, types of variable, collection of data (primary and secondary data), presentation of data by frequency graphs (histogram, frequency polygon, frequency curve and ogive curve). Measures of central tendency, A.M., G.M., H.M., Mode, Median, Quartiles, deciles, percentiles, properties of mean with proofs, weighted A.M., empirical relation between mean, median, modes. Merits and De-merits of various averages.

2. **Measure Of Dispersion And Moments 1/7**

Measures of dispersion (Absolute and relative measures) Range, Mean Deviation, variance, standard deviation, Co-efficient of mean deviation, properties of variance & standard deviation without proofs, moments, moments ratios, Sheppard's corrections, kurtosis and skew ness.

3. **Index Number (1/7)**

Importance of Index Number, problem:, in the construction of whole sale price Index numbers, fixed and Chain base methods, weighted Index numbers, Laspeyres, Paasche's, Fisher's Ideal and Marshal Edgeworth, Types of indices, test for the consistency of Index numbers, Uses and limitations of I.N.

4. Method Of Least Squares: (1/7)

Scater diagram. Principal of least square. Deduction and solution of normal equation of general lincar model. Curve fitting. Equations of approximating curve by the method of east squares upto third degree polynomials.

Fitting of exponential of the (1) y = aebx (2) y= abx (3) y= ax"

5 Graphic representation of the vurces. Interpolation and Extrapolation graphically. Criterial for fitting and Suitable curve .

Time eries 1/7

Time series, component of a time series, analysis of time series,
measurement of secular trend and seasonal variations by various methods, deseasonalization of data.

6. Regression Analysis: 1/7

Regression models. Simple linear regression, least square estimates, properties of least squares regression line, standard error of estimate, co-efficient of determination. Multivariate linear regression with two regressors, co-efficient of multiple determination. Proof of regression line regression co efficient and standard error.

7. Correlation Analysis: 1/7

Linear correlation. Correlation co-efficient and its properties with proof. Correlation of bivariate frequency distribution . partial and multiple correlation for three variables. Rank correlation. Tied ranks.

OUTLINE OF THE SYLLABUS

PAPER-II

1. Probability: 2/7

Random experiments, sample space and events, definitions and axioms of probability, counting techniques, laws of probability with proof, independence of events, Bayes' theorem (proof is not required)

2. Random Variable: 2/7

Random variable, discrete and continuous random variables, distribution function, probability distribution of a discrete and a continuous random variable, joint distributions of random variable (discrete) Marginal and conditional distributions, without Proof. mathematical expectation, properties & its without proof ,numerical problems of mean, variance, moments, concept of moment a generating function properties.

3. **Discrete Probability Distribution: 2/7**

Uniform, Bernouli, Binomial, Hypergeometric, Poisson distributions, mean, variance and shape and their properties, (detailed mathematical derivations are not required) and application of these distributions with examples from various fields.

4. **Continuous Probability Distribution: 2/7**

Continuous random variables, Uniform and Normal distributions, Mean, variance and shape of these distribution with their properties (with proof) of mean variance M.D Mode and medium. Application of these distributions, Normal approximation to the Binomial and Poisson distribution (just application not proof). Fitting of Normal distribution by area method.

OUTLINE OF THE SYLLABUS

PAPER-III (for 4th Year)

1. **Sampling: 1/7**

Basic concepts and terminology, advantages of sampling, probability and non probability sampling, sampling and non-sampling errors, sampling designs of simple random, stratified, systematic and cluster sampling, random numbers and their use in sampling, judgement and quota sampling.

2. **Sampling Distribution: 2/7**

Sampling distribution of a statistic and its standard error, distribution of sample mean, sample proportion, difference between two sample means and two sample proportions, central limit theorem with illustrations (proof not required).

3. **Statistical Inferences: 1/7**

Nature of statistical inference, point and interval estimation of parameters, properties of point estimators, not mathematical derivation confidence interval and its interpretation. Problems about confidence limit for a, 13, mean and variance large and small samples.

4. **Testing of hypotheses 2/7**

Null and alternative hypotheses, simple and composite hypotheses, Type-I and Type-II errors, level of significance, acceptance and rejection regions, power of a tests, one sided and two sided tests, pr9cedure, inference about single mean and difference between mean for paired and unpaired observations. Inference about proportion and difference between two proportions. Determination of sample size for estimating means.

5. **Inference about Variance: 1/7**

Interval Estimation and test of hypothesis about population variance and equality of two variances.

OUTLINE OF THE SYLLABUS

PAPER-IV (for 4th Year)

1. **Analysis Of Variance: 1/7**

Definition, importance and assumption of Analysis of Variance, partitioning of sum of square and degrees of freedom in one-way classification. Testing the equality of means for one-way classification and two way classification.

2. **Analysis of Experimental Designs: 2/7**

Basic principals of experimental design. Completely randomised, randomised complete block and Latin square designs. Description, layout, statistical analysis andvantages and disadvantages of these designs. Relative efficiency of three basic designs. The least significant difference.

3. **Regression and Correlation Analysis: 1/7**

Standard Error of estimates and test of hypothesis about parameters. Testing of correlation co-efficient rank correlation co-efficient simple, partial and multiple correlation.

4. **Non-Parametric Methods: 1/7**

Introduction to non-parametric methods, sign test, runs test, Mannwhitney U tests, of wilcoxon signed Rank list.

5. **The Chi Square Test: 1/7**

The Chi-square test for goodness of fit of binomial, Poisson and normal distribution (with area method) Contingency tables, Yates correction for continuity, coefficient of contingency. The chi-square test for independence.

VITAL STATISTICS 1/7

Definition of vital events and vital statistics. Uses and shortcoming of vital statistics. Sources of demongraphic data. Vital rates and ratios: Sex and child woman ratio. Vital Index, Crude, specific and standarised birth rates, general and specific fertility rates. Reproduction rates: Gross and net reproduction rates. Census, registration system of deaths and births in Pakistan.

Statistics Practicals

The practical will comprise of numerical problems from the topics in paper I and 11 for 3rd year and Paper-II & IV for 4th year.

Division of Marks for Practical in each paper.

Numeric problems	8+8 marks
Viva + N.B.	5+4 marks

Books Recommended

1. Spiegal, M. R.Schiller, J.L. and Srinivasan R.L. (2000). Probability and Statistics, end Ed. Schaums Outline Series. McGraw Hill, New York.
2. Spiegel, M. R. and Stephens, L. J. (1999). Statistics, 3rd Edition, McGraw Hill, New York.
3. Chaudhry, S.M. &—Kamal, S. (1998), Introduction to Statistical Theory Pans I & 11J Ilmi kutab khana, Urdu Bazar, Lahore.
4. Chaudhry, R.M. (1998). Polymer Modem Statistics, Polymers, Urdu Bazar, Lahore.
5. Beg, M.A. and Mirza, M.D.0 997). Statistics: Theory and Methods, Volumes **I** and II. Caravan Book House, kutechery Road, Lahore.
6. Haq Masood-ul, (1983), Foundation of Probability and Statistics, Tahir Sons, Urdu Bazar, Karachi.

7.. Walpole. R. E., (1982). Introduction to Statistics, (4^{th} Ed). MacMillan Publishing Co., New York.