HIGHER SECONDARY (CLASSES XI AND XII)
STATISTICS (PG)

Classical and Axiomatic approaches of statistical probability. Conditional probability and statistical independence. Bayes' theorem. Random variables and probability distributions. Mathematical expectations and moments. Probability generating and moment generating function. Characteristic function and Inversion theorem (statement only). Chebyshev' inequality. Weak and strong laws of large numbers. Bermoulli's theorem. Laws of convergence. Central limit theorem (case of independent variables) and its use.

Concept of statistical population, random sample, frequency curve and coefficient of concentration. Measures of location and dispersion. Moments and measures of skew ness and kurtosis (β_1 – β_2) diagram and its uses. Some standard Univariate distributions (e.g. binomial, Poisson, hyper geometric, negative-binomial, normal and log-normal). Simple correalation and linear regression involving two variables. Non linear regression. Correlation ratio and correlation index. Measures of association and contingency. Rank correlation. Intra-class correlation. Kendall's t Multivariate distributions. Linear regression involving more than one independent variable. Partial and multiple Correlation Coefficients.

Concept of random sampling, sampling fluctuations, sampling distribution of statistics and standard error. Sampling distribution of sums of binomial, Poisson, rectangular and gamma variables. X^2, t and F distributions (central with derivation and non-central without derivation). Sampling distributions under normal set-up for a single mean, a single variance, difference of two means, student's ratio, a variance ratio, a regression coefficient (simple and partial) and correlation coefficient (simple, partial and multiple). Sampling distributions, of order statistics and range from a continuous Univariate distribution. Large sample distribution of a sample quantile. Sampling distribution of Hotelling's T^2 –statistic and its uses. Wilk's A-creterion in sampling from multinormal population. Principal Components and Canonical Correlations. Mahalanobis generalized distance.

Reduction of data—Statistics, sufficient, statistic factorization criteria for sufficiency (statements only) and minimal sufficient statistics. Point estimation – criteria for a good estimator; mean squared error, unbiased ness, minimum variance unbiased estimators, Cramer-Rao inequality. Rao-Blackwell theorem. Completeness, consistency and efficiency (in large sample sense). Methods of estimation – method of moments, maximum likelihood method, least square method. Properties (without detailed proof). Testing of hypotheses – Statistical hypotheses . Classical testing problem, type I and type II errors, critical region, randomized test, size and level of a test, Power function. Neyman-Pearson lemma, test of a simple hypothesis against a simple alternative. MP tests, UMP test, unbiased tests ,UMPU tests. Composite hypothesis. Likelihood ratio tests. Interval estimation – confidence interval and confidence coefficient. Relationship with the theory of hypothesis testing. Sequential analysis—Wald's SPRT. ASN and OC curves. Approximations to ASN and OC functions (without proofs). Optimum properties of SPRT (without proof). Comparison with fixed sample size test under normal case.

Exact test for one or two Bermoulli and Poisson distributions. Exact tests and confidence intervals under normal set up – for a single mean, difference/ ratio of two variances; for a correlation coefficient (simple, partial and multiple), for one or more regression coefficients (simple and partial). Analysis of variance for one-way classified data, two-way classified data and regression problem. Test for homogeneity of variances Large sample tests for one or more proportions and under normal set-up for one or two variances and simple correlation coefficient. Stabilization of variances – $\sin^{-1}\sqrt{p}$, $\sqrt{x}$,

$\log_c$s and Fisher's z-transformations. Pearsonian x^2-tests for goodness of fit, homogeneity and independence (including Yates continuity correction). Nonparametric tests for location, dispersion and randomness. Nonparametric confidence limits and tolerance limits.

Construction and use of price index numbers and tests in connection with them, Consumer price index number. Different components of time series. Determination of trend by different methods. Determination of seasonal indices by methods of ratio to trend and ratio to moving average. Price and income elasticities of demand.

Measurement of mortality – Culde, specific, 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.

Basic principles of design – randomization , replication and local control. Completely randomized design. Randomized block design and Latin square design. Factorial experiments - Main effects and interactions, 2^2 and 2^3 experiments, notion of confounding.

Advantages of sampling method, steps involved in sampling enquiry, requirements of a good sample. Random sampling numbers and their uses. Simple random and stratified random sampling procedures (estimates and their standard errors). Sampling and nonsampling errors.

Statistical quality control – Rational subgroups. Control charts for mean, range, standard deviation, fraction defective and the number of defects. Sampling inspection – single and double sampling procedures by attributes.