STATISTICS

1. Probability : Random experiments, sample space, event, algebra of events, probability on a discrete sample space, basic theorems of probability and simple examples based the conditional probability of an event, independent events, Baye's theorem and its application, discrete and continuous random variables and their distributions, expectation, moments, moment generating function, joint distribution of two or more random variables, marginal and conditional distributions, independence of random variables, covariance, correlation coefficient, distribution of a function of random variables, Bernoulli binormal, geometric negative bionomial, hyper geometric poisoning multinomial, uniform data, exponential, gamma Cauchy, normal lognormal and bivariant normal distributions, real-life situations where these distributions provided appropriate models, Chebyshov's inequality, weak law of large numbers and central limit theorem for independent and identically distributed random variables with finite variance and their simple applications.

2. Statistical methods : concept of a statistical population and a sample, types of data, presentation and summarization of data, measures of central tendency, dispersion skewness and kurtosis measures of association and contingency, correlation, rank correlation. Infraclass correlation correlation ration, simple and multiple linear regression, multiple and partial correlations (involving three variables only),curve-fitting and principle of least squares, concepts of random sample, parameter and statistic, Z, X^2 -test and F statistics and their properties and applications, distributions of sample range and median, (for continuous distributions only), censored sampling (concept and illustrations).

3. Statistical Inference : Unbiasedness, consistency, efficiency, sufficiency, completeness, minimum variance unbiasedness estimation, Rao's Blackwell theorem, Lehmann-Scheffe theorem, Cramer-Rao's inequality and minimum chi-square, methods of estimation, properties of maximum likelihood and other estimators, idea of random interval, confidence intervals for the parameters of standard distribution, shortest confidence intervals, large sample confidence intervals.

Simple and composite hypotheses, two kinds of errors, level of significance, size and power of a test, desirable properties of a good test, most powerful test, Nyman pearson lemma and its use in simple examples, uniformly most powerful test likelihood ration test and its properties and applications.

Chi-square test, sign test, Wald-Wolfowitz run test, run test for randomness medium test Wilcoxon-Mann-Whitney test.

Walla's sequential probability ration test, OC and ASN functions application to binomial regression methods of estimation under simple and stratified random sampling, double sampling for ration and regression methods of estimation, two stage sampling with equal size first stage units.

Analysis of variance with equal number of observation per cell in one, two and three way classifications, analysis of covariance in one and two way classifications, basic principles of experimental designs, completely randomized design, randomized block design Latin squaredesign, missing plot technique 2^M factorial design, total and partial confounding, 3^2 factorial experiments, split-plot design and balanced incomplete block design,

Optimization, Techniques : Different types of models in operational research, their construction and general methods of solution, simulation and Monte - Carlo methods, the structure and formulation of linear programming (LP) problem, simple LP model and its graphical solution, the simplex procedure, the two-phase method and the M-technique with artificial variables, the duality theory of LP and its economic interpretation. Sensitivity analysis, transformation and assignment problems, rectangular games, two person zero-sum games, methods of solution (Graphical and algebraic).

Replacement of failing or deteriorating items, group and individual replacement policies, concept of scientific inventory management analytical structure of inventory problems, simple methods with deterministic and stochastic demand with and without lead time, storage models with particular reference to dam type.

Homogeneous discrete-time Markov chains, transition probability matrix, classification of states and ergodic theorems, homogeneous continuous time Markov chains, poison process, elements of queuing theory M/M/l, M/M/K, G/M/l and M/G l queues.

Solution of statistical problems on computers using well known statistical software packages like SPSS.