

Paper II : Advanced Statistics

Unit : 1 Determinants and Matrices (20%)

1. Definition of Determinant :

Properties of determinants - Calculation of values of determinants up to third order - Definition of a matrix - Different types of matrices - Algebra of matrices - Adjoint of a matrix - Elementary row or column operations. Finding Inverse of a matrix through adjoint and elementary row or column operations. Definition of rank of a matrix. - Finding rank of a matrix up to order 3×3 . Solution of a system of linear equations with unique solution and involving not more than three variables.

Unit : 2 (20%)

1. Differentiation :

Definition of second order derivative stationary values of functions of one variable. Definition of partial derivative involving two variables only up to first and second order - Homogeneous functions of two variables - Euler's theorem and its applications.

2. Integration :

Definition of integral - Simple rules of integration for known functions like xx , ax , ex etc. Evaluation of definite integral - simple illustrations only.

Unit : 3 (20%)

1. SQC (Control Charts) :

Need and use of process control - Theory of control chart - Theory of Runs - standard control charts like \bar{x} -, R , p , np and C Charts - Modified control chart with examples.

Unit : 4 (20%)

1. SQC (Acceptance sampling plans) :

Meaning of lot control basic concepts like producer's and consumer's risks, AQL, LTPD, O.C., ASN, ATI, AOQ and AOQL. Single sampling plan for attributes when two points are fixed on the O.C. curve - Simple examples based upon Hypergeometric, Binomial and Poisson distributions.

Unit : 5 Operations Research (20%)

1. Linear Programming :

Definition of L. P. P. - Formulation of L. P. P. - Solution by graphical method up to two variable - applications of LPP.

2. Transportation Problem :

Def. of transportation problem. Its Formulation - Different methods of obtaining initial basic feasible solution by North-west corner rule, Matrix Minima, Vogel's approximations - Its Applications.

3. Assignment Problem :

Formulation of the problem - Hungarian method of solving an assignment problem Applications.

4. Replacement Problem :

Importance of replacement models. Simple replacement problem when the units get deteriorate as per passage of time value of money remains the same - simple illustrations.

Paper III : Advanced Statistics

Unit : 1 Integral Calculus (20%)

1. (A) Definition of integration as a process reverse to differentiation - Some standard results based on exponential and polynomial functions - Integration by the method of substitution and by parts - Method of partial fractions upto 2 fractions-Illustrations.

(B) Definite Integral - Properties of definite integral, application of definite integral to find areas - Simple applications of definite integral in business and commerce.

2. Differential Equation

Concept of differential equation - simple form where the variables are separable - Linear differential equation separable - Linear differential equation - some applications pertaining to business.

Unit : 2 (20%)

1. Mathematical Expectation :

Mathematical expectation of a random variable and function of random variable in discrete and continuous cases - Basic theorems of expectation - Moment generating function, Cumulant generating, function Moments and Cumulants - coefficients $\beta_1, \beta_2, \gamma_1, \gamma_2$. Relations between moments and cumulants - Mathematical expectation for Bi-variate distribution - Marginal and conditional distribution - Conditional Mean and variance in Bi-Variate case - Illustrations.

Unit : 3 Element of Statistical Inference (20%)

1. Estimation Theory :

Need and use of process control - Theory of control chart - Theory of Runs - standard control charts like \bar{x} -, R, p, np and C Charts - Modified control chart with examples.

2. Testing of Hypothesis :

Properties of estimators - consistency, unbiasedness, efficiency and sufficiency of estimators - Cramer - Rao inequality (statement only). method of maximum likelihood - simple illustrations for distribution only.

Unit : 4 Large Sample Test and small sample tests (20%)

1. Large Sample tests for attributes and Variables - 95% and 99% confidence intervals only.

- (i) Test for number of Success and proportions.
- (ii) Test for difference between two proportions.
- (iii) Test for Sample mean.
- (iv) Test for difference between two means.
- (v) Test for difference between two standard deviations.

2. Introduction to Chi-square distribution - Student's t distribution, Snedecore's and Fisher's Fstatistic-Properties of these distributions.

Tests of significance based upon χ^2 , t, F distributions - 95% and 99% confidence intervals for mean and variance for normal population.

Unit : 5 (20%)

1. Game Theory :

2 x 2 game problem with and without saddle point. Rules of dominance. Conversion of game problem into a I.P.P and its solution by Graphical Method.

2. PERT and CPM :

Concept of Network - Critical Path Method - Pert Network and determination of average times solving PERT network for simple problems.