Syllabus for Ph.D. Entrance Test
Session 2023-24

1. Distribution and Probability Theory

Random variables, Distribution function and its properties, joint, marginal and conditional distribution, continuous and discrete distributions, conditional expectation, some moments inequalities, central t, F and X^2 distributions.

Borel field, sigma field, limsup, liminf of a sequence of sets, probability measure, various types of convergence, WLLN, SLLN, characteristics function and related theorem

2. Linear Algebra and Matrices

Rank of a Matrix & its properties, inverse and generalized inverse of a matrix, solution of linear equations, characteristics roots and vectors, Cayley- Hamilton Theorem, Gram-Schmidt orthogonalization process, quadratic forms, Matrix and vectors differentiation.

3. Sampling Techniques

Simple Random Sampling, Stratified Sampling, Systematic Sampling, PPS Sampling, Ratio, regression and product estimators, Cluster and Two-stage sampling schemes, Estimation of sample size, Randomized Response Technique

4. Multivariate Analysis

Multivariate normal distribution, Wishart Distribution, Hotelling T^2, Discriminant analysis, principal component analysis, canonical correlation.

5. Design of Experiments

CRD, RBD, LSD, C-matrix, factorial experiment (2^n, 3^n), confounding, BIBD, PBIBD.

6.Statistical Inference

Properties of good estimator, Factorization Theorem, Completeness, Bounded completeness, Cramer Rao and Chapman-Robbins-kiefer inequalities, Rao-Blackwell Theorem, Lehmann-Scheffe Theorem, MVUE, Methods of estimation and confidence intervals, Types of hypothesis, of tests, likelihood ratio tests and its asymptotic distribution.

7.Operations Research

Convexity and geometry related to LPP, Linear Programming Problem and methods to solve it, Duality and related theorems, Transport Problem and Assignment problem, Job sequencing

8.Linear Models and Econometrics

Gauss Markov Setup, Simultaneous estimates of linear parametric function , analysis of variance and multiple comparison test , Fixed and random effect model .Multiple linear regression.

Multicollinearity, Autocorrelations, Heteroscedasticity and their effect, detection and remedial methods.
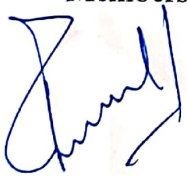
9.Stochastic Process

Stochastic Process and its classification, Markov Chains, Chapmann-Kolmogrov equations, n-step transition probability, Random walk and Gambler's ruin problem, Poisson process, Renewal process. Branching process

10.Basics of Programming (C++, R)

Concept of flowchart and Algorithm, Compiler, Assembler, Linker, Memory and its types, Development of programming language, Data types, selection statements, arrays and loop statements.

Members of D.R.C.

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