Faculty of Science

M.Sc. / M.A. (Operations Research)

DEPARTMENT OF STATISITICS & OPERATIONS RESEARCH
ALIGARH MUSLIM UNIVERSITY ALIGARH

Syllabus for M.A./M.Sc. Entrance Test in Operations Research

Descriptive Statistics: Data: quantitative and qualitative, attributes, variables, scales of measurement- nominal, ordinal, interval and ratio. Measures of Central Tendency and Measures of Dispersions, Skewness and Kurtosis,. Bi-variate data, Correlation (simple, partial and multiple), rank correlation. and Regression Analysis. Principle of least squares and fitting of polynomials and exponential curves.

Probability and Probability Distributions: Basics **of** Probability, conditional Probability, Bayes' theorem and its applications. Random variables, p.m.f., p.d.f. and c.d.f., illustrations and properties of random variables, uni-variate transformations with illustrations. Two dimensional random variables: joint, marginal and conditional p.m.f, p.d.f., and c.d.f., independence of variables. Mathematical expectation and generating functions, characteristic function. Conditional expectations. Standard probability distributions (discrete and continuous) with their properties. Central Limit Theorem. and Chebeshev's In-equality, Tests of significance based on t, Z, F and Chi-square distributions.

Statistical Inference: Estimation: Concepts of estimation, unbiasedness, sufficiency, consistency and efficiency. Factorization theorem. Cramer-Rao inequality , Methods of Estimation: Method of moments, method of maximum likelihood estimation, method of minimum Chi-square,. Test of Hypothesis: Null and alternative hypotheses (simple and composite), Type-I and Type-II errors, critical region, level of significance, size and power, best critical region, most powerful test.

Survey Sampling: Concept of sample and population, complete enumeration versus sampling, sampling and non-sampling errors, requirements of a good sample, simple random sampling with and without replacement and basic Sampling Methods (SRS, Systematic stratified).

Operations Research: Linear Programming Problem, Mathematical formulation of the L.P.P, graphical solutions of a L.P.P. Simplex method for solving L.P.P. Charne's M-technique for solving L.P.P. involving artificial variables. Special cases of L.P.P. Concept of Duality in L.P.P: Dual Simplex method. Transportation Problem: North West corner rule, Least cost method, Vogel's approximation method (VAM) and MODI's Method. Assignment problem: Hungarian method. Game theory: minimax-maximin principle, Graphical method, dominance and modified dominance.

Calculus: Real valued sequences and series, convergence / divergence of sequences and series, comparison test, real valued functions, limit and continuity, power series, Differential and Integral Calculus - Differentiability, Rolle's theorem, Mean value theorem and Taylor / Maclaurin expansions, higher order derivatives and partial derivatives, maxima and minima of functions of one variable.

Elements of Linear Algebra: Vector space, subspace, dimension of a vector space, real valued matrices, rank, determinant and inverse of a matrix, properties of square, diagonal and symmetric matrices, characteristic roots and vectors of a matrix, simultaneous linear equations.