

**DA-IICT Gandhinagar, India**

**M.Sc. (Data Science)**

**Syllabus for Entrance Test**

The entrance examination will primarily check basic aptitude in mathematics and statistics, understanding of algorithms and programming, and the ability to logically interpret data. Entrance test will consist of multiple choice questions from the following four sections.

**Section I - Quantitative Aptitude:** Logical Reasoning and Verbal Ability.

**Section II: Computer Science**

*Data structures:* Arrays (one-dimensional and multi-dimensional), indexing, row/column major array addressing; strings; stacks; queues.

*Programming concepts (Pseudocode and C language):* variables and scope of variables (global, local); constants; data types, static, dynamic; expressions; arithmetic, logical, bitwise and conditional operators; iteration; logic building; functions.

*Object oriented programming (C++ language):* classes, object instances, inheritance.

*Algorithms (Pseudocode):* Searching (linear and binary); sorting; asymptotic worst case time and space complexity.

**Section III: Mathematics**

*Sequences and Series of real numbers:* Sequences of real numbers, bounded and monotone sequences, convergence criteria for sequences of real numbers, Series of real numbers, absolute convergence, tests of convergence for series of positive terms: comparison test, ratio test, root test.

*Functions of one real variable:* Limit, continuity, intermediate value property, differentiation, Rolle 's Theorem, mean value theorem, L'Hospital rule, Taylor's theorem, maxima and minima

*Functions of two and three variables:* Limit, continuity, partial derivatives, directional derivative, differentiability, maxima and minima.

*Integral calculus:* Integration as the inverse process of differentiation, definite integrals and their applications, fundamental theorem of calculus.

*Differential equations:* Ordinary differential equations of first order: linear equations, Bernoulli's equation, exact differential equations, integrating factor.

*Linear algebra:* Finite dimensional vector spaces, linear independence of vectors, basis, dimensions, linear transformations, matrix representation, range space, null space, rank-nullity theorem, rank and inverse of a matrix, determinant, solutions of systems of linear equations, consistency conditions, eigenvalues and eigenvectors for matrices, Caley-Hamilton theorem.

#### **Section IV: Statistics**

*Descriptive Statistics:* Measures of central tendency, graphs, boxplot, percentiles, correlation, covariance, linear regression.

*Probability:* Axiomatic definition of probability and properties, conditional probability, multiplication rule. Theorem of total probability. Bayes' theorem and independence of events.

*Random Variables:* Probability mass function, probability density function and cumulative distribution functions, distribution of a function of a random variable, mathematical expectation, moments.

*Standard Distributions:* Binomial, negative binomial, geometric, Poisson, hyper geometric, uniform, exponential, and normal distributions. Poisson and normal approximations of a binomial distribution.