

**SVKM's NMIMS University**

**Mukesh Patel School of Technology Management & Engineering, Mumbai**

**Department of Artificial Intelligence**

**Syllabus for PhD Entrance Test**

**Effective from May, 2026**

## **SECTION- A**

Section A will include 25 compulsory objective-type questions, each carrying 2 marks. It will be focused on research aptitude. The section will be general in nature and aims to evaluate the candidate's research aptitude, with emphasis on reasoning ability, data interpretation, and quantitative skills.

## **SECTION-B**

Section B will comprise 25 compulsory objective-type questions, each carrying 2 marks, based on the following syllabus:

### **UNIT I- PROBABILITY AND STATISTICS**

Counting, probability axioms, sample space, events, conditional probability, Bayes' Theorem, random variables (discrete and continuous), probability distributions (uniform, normal, Poisson), t-distribution, chi-squared distribution, mean, median, mode, variance, correlation, covariance, and hypothesis testing (z-test, t-test, chi-square).

### **UNIT II- LINEAR ALGEBRA**

Vector spaces, subspaces, linear independence and dependence, matrices (orthogonal, idempotent), systems of linear equations, eigenvalues, eigenvectors, rank, nullity, and singular value decomposition (SVD).

### **UNIT III- CALCULUS AND OPTIMIZATION**

Functions of a single variable, limits, continuity, differentiability, Taylor series expansion, maxima and minima, and basic optimization techniques.

### **UNIT IV- PROGRAMMING, DATA STRUCTURES, AND ALGORITHMS**

Programming in Python, basic data structures (arrays, stacks, queues, linked lists, trees, hash tables), searching algorithms (linear, binary), sorting algorithms (bubble, selection, insertion, merge, quicksort), graph algorithms (BFS, DFS, shortest path), and time complexity analysis.

### **UNIT V- DATABASE MANAGEMENT AND WAREHOUSING**

ER-model, relational model (SQL, relational algebra), normalization, integrity constraints, indexing, data transformation (normalization, discretization, sampling), and OLAP/data warehousing concepts.

## **UNIT VI- MACHINE LEARNING**

Supervised learning (linear regression, logistic regression, KNN, Naive Bayes, SVM, decision trees), neural networks, bias-variance tradeoff, cross-validation, unsupervised learning (clustering, k-means, hierarchical), and dimensionality reduction (PCA).

## **UNIT VII- ARTIFICIAL INTELLIGENCE**

Informed vs Uninformed Search in AI, propositional logic, Predicates and Quantifiers, reasoning under uncertainty topics, conditional independence representation, exact inference through variable elimination, and approximate inference through sampling.