OUTLINES OF TESTS, SYLLABI AND COURSES OF READING

for

B.C.A. Mathematics Part I (Semester I & II)

Academic Sessions
2025–26 and 2026–27

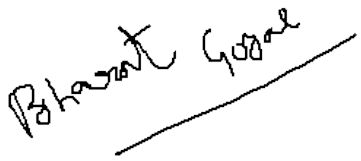
NEP-TEMPLATE FOR MULTIDISCIPLINARY UG PROGRAMME

POST GRADUATE DEPARTMENT OF MATHEMATICS
GURU NANAK COLLEGE BUDHLADA
AN AUTONOMOUS COLLEGE
Email: gncbudhlada@yahoo.co.in
Website: www.gncbudhlada.org

SCHEME OF THE COURSE

B.C.A. I SEMESTER I & II

Semester I							
Type of Course	**Course Code**	**Course Title**	**Internal**	**External**	**Practical**	**Total**	**Credit**
MAJOR	BCA1101T	Mathematical Foundation to Computer Science-I	30	70	-	100	04
Semester Ii							
MAJOR	BCA1201T	Mathematical Foundation to Computer Science-II	30	70	-	100	04



SEMESTER I
BCA1101T: Mathematical Foundation to Computer Science-I
(Major)

Credits: 04(L) External Exam Marks: 70
Time Allowed: 3 Hrs. Internal Assessment: 30
Pass percentage: 35% Total Marks: 100

COURSE OBJECTIVES: The objective of this course is to develop a foundational understanding of algebra and linear algebra. It aims to equip students with the skills to solve problems involving complex numbers and quadratic equations. The course also introduces matrix operations and determinants to solve systems of linear equations, fostering logical reasoning and mathematical thinking.

COURSE OUTCOMES:

1. Demonstrate a clear understanding of **complex numbers** and **quadratic equations**, including their algebraic properties, solutions, and applications in solving mathematical problems with both real and complex coefficients.
2. Perform operations on **matrices and determinants**, including addition, multiplication, transpose, inverse, and determinant expansion, and use these tools to solve systems of linear equations effectively.
3. Analyze and determine the **rank and consistency** of linear systems using matrix methods and **Cramer's Rule**, and apply theoretical understanding in solving real-world problems involving linear algebra.

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections A, B & C. Section A & B will have four questions from the respective section of the syllabus and will carry 12 marks each. Section C will have 11 short answer-type questions of 2 marks each, which will cover the entire syllabus and will carry 22 marks in all.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt two questions each from section A & B of the question paper and the entire section C.

SECTION-A

Complex Numbers: Complex Numbers in the form of $a + \iota b$, Real and Imaginary parts of a complex number, Complex conjugate, algebra of complex numbers, square roots of a complex number, cube roots of unity.

Quadratic Equations: Solutions of Quadratic equations (with real and complex coefficients), Relations between roots and coefficients, Nature of roots, Equations reducible to quadratic equations.

Cartesian System of Rectangular Coordinates: Cartesian coordinate system, distance formula, section formula, centroid and incentre, area of triangle, condition for collinearity of three points in a plane.

SECTION-B

Matrices: Types of Matrices, Addition, Subtraction, Multiplication, Transpose, Conjugate and their properties, Symmetric and skew-symmetric Matrices, Minor, Co-factor, Adjoint.

Determinant: Evaluation of determinant upto 3x3 order, Inverse of a matrix, Solution of linear system of equations using matrices, solution of linear system of equations using Cramer rule.

Rank of a matrix by using Row reducing Echelon form.

RECOMMENDED BOOKS

1. N.C.E.R.T. Textbooks of Mathematics for +1 and +2.
2. M.K. Jain, S.R.K. Iyengar and R.K. Jain, “Numerical Methods for Scientific and Engineering Computation”, Wiley.
3. B.S. Grewal, Higher Engineering Mathematics", Khanna Publishers.

SEMESTER II
BCA1201T: Mathematical Foundation to Computer Science-I
(Major)

Credits: 04(L) External Exam Marks: 70
Time Allowed: 3 Hrs. Internal Assessment: 30
Pass percentage: 35% Total Marks: 100

COURSE OBJECTIVES: The primary objective of this course is to provide a strong foundation in mathematical concepts that are essential for computer science. The course aims to equip students with the ability to apply principles from discrete mathematics, including set theory, logic, relations, functions, graph theory, and recurrence relations, to solve problems.

COURSE OUTCOMES:

1. Students will understand and apply the concepts of set theory and logic, including propositional equivalence and the Principle of Inclusion-Exclusion.
2. Students will be able to work with different types of relations and functions, such as equivalence relations, partial ordering, one-to-one, and onto functions.
3. Students will be able to solve recurrence relations and will be familiar with the definitions of Big-O, Big-Omega, and Big-Theta notations.
4. Students will gain foundational knowledge of graph theory and trees, including graph isomorphism, spanning trees, and various paths and circuits.

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections A, B & C. Section A & B will have four questions from the respective section of the syllabus and will carry 12 marks each. Section C will have 11 short answer-type questions of 2 marks each, which will cover the entire syllabus and will carry 22 marks in all.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt two questions each from section A & B of the question paper and the entire section C.

SECTION-A

Set Theory: Sets, Type of sets, Set operations, Principle of Inclusion-Exclusion, Cartesian product of sets, Partitions.

Logic: Propositions, Implications, Precedence of logical operators, Translating English sentences into logical expressions, Propositional equivalence.

Principle of Mathematical induction.

Relations: Relations and diagraph, n-ary relations and their applications, properties of relations, representing relations, closure of relation, equivalence relation, operation on relations, partial ordering.

Rakesh Kumar Bharat Gupta Satish

SECTION-B

Functions: Functions, One-to-one Functions, Onto Functions, Inverse and Composition of Functions, Floor Function, Ceiling Function.

Basic Concepts (Only Definition): Big-O Notation, Big-Omega and Big-Theta Notation.

Recurrence Relations: Solving Recurrence Relations, Generating Functions for sorting recurrence relations.

Graphs: Introduction to Graph, Graph terminology, Representing graphs and Graph Isomorphism, Connectivity, Euler Paths and Circuits, Hamiltonian paths and circuits, Shortest Path Problems, Planar Graphs.

Trees: Trees, labelled trees, Tree Traversal, Undirected trees, Spanning Trees, Minimum spanning trees.

RECOMMENDED BOOKS

1. Discrete Mathematical Structures - Bernard Kolman, Robert C. Busby, Sharon C. Ross, 4th Edition, Pearson Education Asia.
2. Discrete Mathematics - Richard Johnsonbaugh, 5th Edition, Pearson Education, Asia.
3. Elements of Discrete Mathematics, Second Edition, Tata McGraw Hill.
4. Discrete Mathematics, Seymon Lipschutz & Max Lans Lipson, Tata McGraw Hill.
5. Discrete mathematics and its applications, Rosen, Kenneth H.,Tata McGraw Hill.