

## **M.A./M.Sc. (Maths)**

### **Previous Year**

# **TOPOLOGY**

## **Paper\_I**

### **UNIT - I**

Chapter 1 : Elements of set Theory

Sets, Functions and Relations, Real Numbers, Products and Co-products, Finite and Infinite sets, Countable and Uncountable, Well - Ordered sets, Partially Ordered sets, The Maximum Principle and Zorn's lemma.

### **UNIT - II**

Chapter 2 : Metric Space

The real line  $\mathbb{R}$ , Metric, Euclidean Spaces, Some Important Inequalities, Bounded and Unbounded Metric Spaces, Some Important Metric Spaces, Spheres (or Balls), Open sets, Closed sets, Neighbourhood, Accumulation points, Adherent points, Closure, Interior, Exterior and Boundary of a set, Dense and Non-dense sets, Sequences and Sub-sequences in a Metric space, Cauchy's Sequence, Complete Metric Space, Completeness and Contracting Mappings, Some Complete Metric Spaces, Completion of a Metric Space

### **UNIT - III**

Chapter 3 : Topological Spaces

Topological Spaces, Order topologies, The Product topology, The subspace topology, Closed sets and limit points, Continuous function, The quotient topology, Metric Topology, Connected spaces, Compact spaces, Locally compact spaces and Alexandroff Compactification

### **UNIT - IV**

Chapter 4 : Normal Spaces 134-148

Countability Axioms, Separation Axioms, Normal spaces, Second countable regular spaces and the Urysohn metrization theorem, Completely regular spaces and the Stone-ech compactification, Answer of Multiple Choice Questions

**M.A./M.Sc. (Maths)**  
**Previous Year**  
**Real Analysis**  
**Paper\_II**

**Unit-I**

Chapter - 1 Real Number System & Real Line

Real Number system, Mathematical induction, The Real line

Chapter - 2 Limit, Continuity and Differentiability

Functions and Limits, Continuity, Differential functions of one variable, L' Hospital's Rule, Taylor's theorem

**Unit-II**

Chapter - 3 Riemann Integral and Improper Integrals

Definition of the Integral, Existence of the Integral, Properties of the Integral, Improper Integrals, A more advanced look at the Existence of the proper Riemann Integral

Chapter - 4 Sequence and Series

Sequence of real numbers, Real Topics Revisited with sequences, Infinite series of constants, Sequence and series of Functions

**Unit-III**

Chapter - 5 Structure of  $\mathbb{R}^n$  and Functions of Several Variables

Structure of  $\mathbb{R}^n$ , Continuous Real - Valued functions of  $n$  variables, Partial Derivatives and the Differential, The chain Rule and Taylor's theorem

Chapter - 6      Linear Transformations and Matrices

Linear Transformations and Matrices, Continuity and Differentiability of transformations

## **Unit-IV**

Chapter - 7      Multiple Integrals

Definition and Existence of the Multiple Integral, Iterated Integrals and Multiple Integrals, Change of variables in Multiple Integrals, Answer of Multiple Choice Questions

**M.A./M.Sc. (Maths)**  
**Previous Year**  
**Partial Differential**  
**Paper\_III**

**Unit - I**

CHAPTER - 1 An Introduction to Partial Differential Equations

Order and Degree; Linear Partial Differential Equation of First Order; Lagrange's Linear Equation; Compatible System of First Order Equations; Lagrange's Auxiliary Equations; Charpit's Method; Jacobi's Method; Monge's Method of the Type  $(Rr+Ss+Tt = V)$

**Unit - II**

CHAPTER-2 Partial Differential Equations of Second Order

Linear Homogeneous Partial Differential Equation with Constant Coefficients; Method of finding P.I. of A Linear Homogeneous Partial Differential Equation; Non-Homogeneous Linear Partial Differential Equation with Constant Coefficients; Method for Finding the C.F. and P.I. of Non-Homogeneous Equations with Constant Coefficients; Equations Reducible to Linear Partial Differential Equation with Constant Coefficient

CHAPTER-3 Elliptic Differential Equations

Product Method : Solutions fo Boundary Value Problems by The Method fo Separation of Variables; Laplace Equation; Harmonic Function; Solution of two Dimensional Laplace Equation : Separation of Variables; Solution of Laplace Equation of Three Dimensional; Solution of Two-dimensional Laplace Equation in Plane Polar Coordinate; Solution of Laplace Equatin in Cylindrical Coordinates; Solution of Laplace Equation in Spherical Coordinates

**Unit - III**

CHAPTER - 4 Parabolic Differential Equations

One Dimensional Heat Equation; Solution of One Dimensional Heat Equation; Solution of Two Dimensional Heat Equation; Solution of Three Dimensional Heat Equation; Solution of Hat Equation in Cylindrical Coordinates; Solution of Hat Equation in Spherical Coordinates; Uniqueness of the Solution and Maximum-Minimum Principle

CHAPTER - 5 Hyperbolic Differential Equations

Forms of Wave Equation; Derivation of One Dimensional Wave Equation; Derivation of Two Dimensional Wave Equation; Solution of One Dimensional Wave Equation; D'Alembert's Solution of Wave Equation; Solution of Two Dimensional Wave Equation; Forced Vibrations : Solution of Non-Hameogeneous

Equation; Boundary and Initial Value Problems for Two Dimensional Wave Equation : Method of Eigen Function; Solution of Wave Equation in Polar Coordinates : Vibration of A Circular Membranes; Solution of Wave Equation in Cylindrical Coordinates; Solution of Wave Equation in Spherical Polar Coordinates; Uniqueness of the Solution for the Wave Equation

## **Unit - IV**

CHAPTER - 6 Green, Dirac Delta and Harmonic Function

The Dirac Delta Function; The Sampling Property of the Dirac Delta Function; The Delta Function As a Limit; Properties of the Dirac Delta Function And its Derivatives; Green's Function for Diffusion Equation; Some Important Uniqueness Theorem; Potential Theory; Kelvin Inversion Theorem; Poisson's Integral Formula : Potential Equation for A circle: Green's Function for Dirichlet Problem; The Neumann Problem; Solution of One Dimensional Wave Equation; Solution of Wave Equation by Laplace Transform; Properties of Harmonic Function

ANSWER OF EXERCISES

**M.A./M.Sc. (Maths)**

**Previous Year**

# **Discrete Mathematics**

**Paper\_IV**

## **UNIT-I**

*Chapter 1* Introduction

*Chapter 2* Mathematical Logic

*Chapter 3* : Conditional Statement/Bi-conditional Statements

## **UNIT-II**

*Chapter 4* Boolean Algebra

*Chapter 5* Predicate Calculus and Quantifier

*Chapter 6* Set Theory

## **UNIT-III**

*Chapter 7* Relation and Functions.

*Chapter 8* : Algebraic Structure

*Chapter 9* Subgroups & Normal Subgroups.

*Chapter 10* : Ring, Field and Integraldomain

## **UNIT-IV**

*Chapter 11* : Linear Spaces (Vector Spaces)

*Chapter 12* : Linear Transformations

*Answer of Exercises*