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

## Final Year

# Operation Research

## Paper-V

## Unit –I

1 – Introduction

The origin and the development of O.R., The Nature and Definition of OR, Objective of OR, Phases of OR Method, Areas of Applications of OR, Scientific Method in OR, Characteristics of Operations Research, Modeling in OR, Types of Models, General Methods of Solution for OR Models

2 – Mathematical Preliminaries

Elementary Probability Theory, Matrices and Determinants, Vectors and Vector Spaces, Simultaneous Linear Equations, Finite Difference, Differentiation of Integrals, Generating Functions

## Unit –II

3 – Inventory Theory

Inventory, Variables in an Inventory Problems, Need of Inventory, Classification or Categories of Inventory Models, Deterministic Models, Deterministic Models with Shortage, Multi Item, Deterministic Models with one Constant, Probabilistic Models, Purchase Inventory Models with Price Breaks,

4 – Replacement Problems

Replacement and Replacement Situations, Replacement of Major of Capital Item that Deteriorates with time, To determine the Best Replacement Age of Items whose Maintenance Costs Increase with time and the value of money also change with time, Replacement of Items in Anticipation of Complete Failure the Probability of Which Increase with time, To Determine the interval of Optimum Replacement, Problems in Mortality, Staffing Problem; Mortality Tables,

5 – Allocation (General Linear Programming Problems)

General Linear Programming Problems, Mathematical Formulation of a L.P.P, Basic Solution, Solution of a Linear Programming Problem, Geometrical Method for the solution of a Linear

Programming Problem, Analytic Method, Slack and Surplus Variables, Application of Linear Programming Techniques, Limitations of Linear Programming

## Unit –III

6 – Convex Sets and Their Properties

Some Important Definitions, Some Important Theorems

7 – Simplex Method

Simplex Method, Fundamental Theorem of Linear Programming, To obtain B.F.S. from a F.S., To Determine Improved B.F.S., Unbounded Solutions, Optimality Conditions, Alternative Optimal Solutions, Inconsistency and Redundancy in Constraint Equations, Artificial Variables Technique, Degeneracy in Simplex Method, Solution of System of Simultaneous Linear Equations by Simplex Method, Inverse of a Matrix by Simplex Method

## Unit –IV

8 – Transportation Problem

Transportation Problem, Mathematical Formulation of a Transportation Problem, Solution of a Transportation Problem, Optimality Test, Degeneracy in Transportation Problems, Unbalanced Transportation Problems, Profit Maximization Problems

9 – Network Analysis (PERT – CPM)

The Theory of Graphs, Network, CPM/PERT Techniques

Answer of Exercises

# Complex Analysis

## Paper-VI

## Unit – I

Chapter - 1 Complex Numbers

Complex Numbers, Properties of the Addition of Complex Numbers, Properties of the Multiplication of Complex Numbers, Difference of Two Complex numbers, Division in C, Modulus of A Complex Number, Conjugate of A Complex Number, Modulus-argument Form or Polar Standard Form or Trigonometric, Form of A Complex Number, The Geometrical Representation of Complex Numbers, The Points on the Argand Plane Representing The sum, Difference, Product And Division of Two Complex Numbers, More Properties of Moduli And Arguments, Theorem: The order Relations Greater Than or Less Than Do Not Apply, To Complex Numbers, Some Important Results About Complex Numbers, Integral And Rational Powers of A Complex Number, Geometrical Applications of Complex Numbers, Complex Equation of A Straight Line In The Complex Plane Projection, Equation of A Circle in The complex Plane, The Spherical Representation of Complex Numbers And Stereo graphic Projection

## Unit – II

Chapter - 2 Analytic Functions

Curves in the Argand Plane, Functions of a Complex Variable, Neighborhoods of a Point, Limits And Continuity, Differentiability, Analytic, Holomorphic and Regular Functions, The Necessary and Sufficient Conditions For f(z) To be Analytic, Polar Form of Cauchy-Riemann Equations, Derivative of w= f (z) In Polar Form, Orthogonal System, Harmonic Function, Methods of Constructing a Regular Function (Milne-Thomson's Method), Multiple Valued Functions

## Unit – III

Chapter - 3 Complex Integration

Introduction, Definitions, Rectifiable Arcs, Functions of Bounded Variation, Complex Integrals, Evaluation Of Some Integrals, ab-initio (By definition), Reduction Of Complex Integrals To Real Integrals, Some Elementary Properties Of Complex Integrals, An Upper Bound For A Complex Integral, Line Integrals As Functions Of Arcs, Cauchy's Fundamental Theorem, Cauchy Goursat Theorem. (Second proof ), Cauchy Goursat Theorem. ( Third proof ), Cauchy's Integral Formula, Derivative Of An Analytic Function, Higher Order Derivatives Of An Analytic Function, Poisson's Integral Formula For A Circle. Morera's Theorem. Cauchy's Inequality, Indefinite Integrals, Integral Function, Expansion Of Analytic Functions As Power Series : Taylor's and Laurent's series

# Unit – IV

Chapter - 4 Zeros and Singularities of an Analytic Function, Meromorphic Function

Introduction, Definitions, The Zeros of An Analytic Function, Singularities of An Analytic Function, Polynomials and Its Characterizations, Rational Functions and its Characterizations, Theorems on Poles and Other Singularities, Maximum Modulus Principle, Minimum Modulus Principle, The Excess of the Number of Zeros Over the Number of Poles of a Meromorphic Function. The Argument Principle, Rouche's Theorem, Schwarz Lemma, Fundamental Theorem of Algebra

Answer of Objective type Questions

# Mathematical Statistics

## Paper_VII

### UNIT – I

CHAPTER- 1 Frequency Distributions and Measures of Central Tendency

Classification and Tabulation, Frequency Polygon, Histogram and Ogive, Measures of Central Tendency, Arithmetic Mean, Median, Mode, Geometric Mean, Harmonic Mean, Quartiles and Partition Values

CHAPTER- 2 Measures of Dispersion, Skewness, Moments and Kurtosis

Range, Quartile Deviation, Standard Deviation, Mean Deviation, Coefficient of Variation, Relation between central moments and moments about any arbitrary origin

### UNIT – II

CHAPTER- 3 Probability

Definition, Addition theorem of Probability, Multiplication Theory of Probability, Dependent and Independent Events, Probability of at least one event, Binomial and Multinomial theorems, Probability Axiomatic Approach, Conditional Probability, Theorem of Total Probability for Compound Events

### UNIT – III

CHAPTER- 4 Method of Least Squares and Curve Fitting

Method of Least Squares, Some Special Curves

CHAPTER- 5 Bivariate Distribution, Correlation and Regression

Scatter or Dot diagram, Karl-Pearson's Coefficient of Correlation, Sterograms and Correlation Surface, Probable Error of Coefficient of Correlation, Spearman's Rank Correlation, Regression, Properties of Regression coefficients, Correlation Ratio

CHAPTER- 6 Multiple and Partial Correlations

Multiple Correlation, Partial Correlation, Multiple Correlation Coefficient, Partial Correlation Cofficient

CHAPTER- 7 Consistence of Data and Association of Attributes

Attributes, Class Frequencies, Consistence of Data, Independence and Association of Attributes

# UNIT – IV

CHAPTER- 8 Finite Differences and Interpolation

E and D Notation, Factorial Notation, Interpolation, Central Differences, Distinguish between Interpolation and Extrapolation, Divided Difference Formula

CHAPTER- 9 Index Numbers

Uses, Construction of Index Numbers, Fixed and Chain Bases, Index Numbers Based on Arithmetic Mean, Fisher's Ideal Index Number, Circular Test

CHAPTER- 10 Analysis of Time Series

Movements, Methods of Determining Trend, Estimation of Seasonal Trend, Utility of Time Series, Link Relative Method

Answer of Multiple Choice Questions

# M.A./M.Sc Final Year

# (OOPs and Programming in C++)

खण्ड - **I**



खण्ड - **II**



खण्ड - **III**



खण्ड - **IV**