B.A/B.Sc.- Part III

MATHEMATCS

For Sessions 2022-23, 2023-24 & 2024-25

Department of Mathematics

Punjabi University, Patiala

B.A\B.Sc.- Vth and VI th Semester

MATHEMATICS

For Session 2022-23, 2023-24, 2024-25

SEMESTER-V

Code	Title of Paper/Subject	Max. Cont. Asmt.	Marks Univ. Exam.	Total
Paper-I	Abstract Algebra	10	40	50
Paper- II	Mathematical Methods- I	10	40	50
Opt. I	Discrete Mathematics-I	10	40	50
Opt.-II	Probability Theory	10	40	50

SEMESTER-VI

Code	Title of Paper/Subject	Max. Cont. Asmt.	Marks Univ. Exam.	Total
Paper-III	Optimization Techniques	10	40	50
Paper- IV	Mathematical Methods-II	10	40	50
Opt. III	Discrete Mathematics- II	10	40	50
Opt. IV	Complex Variables`	10	40	50

for Head
Mathematics Deptt.
Punjabi University, Patiala
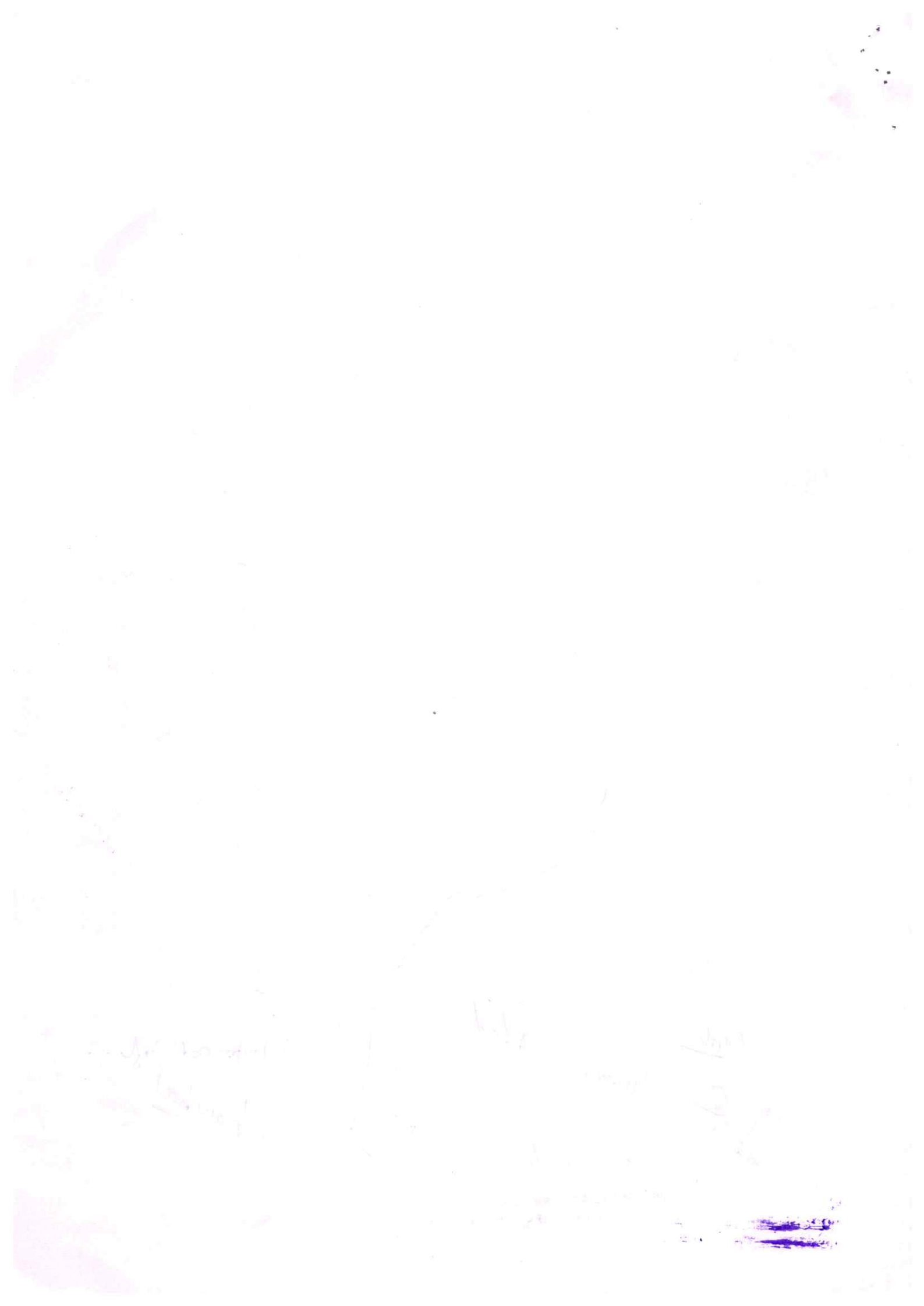
B.A\B.Sc.- V TH

Semester

Paper-I: Abstract Algebra

For Regular Students
Maximum Marks:50 Marks
University Exam: 40
For Distance Education Students/Private Students
Maximum Marks: 50 Marks (No Internal Assessment)

Maximum Time: 3 Hrs.
Teaching Hours: 50
Internal Assessment: 10

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and Section C will consist of one compulsory question having eight short answer type questions covering the entire syllabus uniformly. The weightage of Section A and B will be 60% and that of Section C will be 40%

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions in all selecting two questions from eachof the Section A and B and compulsory question of Section C.

Section-A

Group: definition, examples, subgroups, counting Principle, Langrange's theorem, Normal subgroups, Quotient groups, Homomorphisms, Fundamental theorem of homomorphism and related theorems. Cyclic Groups.

Section- B

Rings: Definition and examples of Rings, Elementary properties of Rings. Sub-rings, Homomorphism, ideals and Quotient Rings, Field of Quotient of Integral domain, division rings . Euclidean Rings, Principal ideals, examples.

Recommended books:

1. Text book on Algebra and Theory of equations by Chandrika Prasad.PothishalaPvt. Ltd.
2. Herstein, I.N.: Topics in Algebra
3. Linear Algebra by Schaum Outline series.
4. Surjeet Singh and Qazi Zameeruddin: Modern Algebra (Relevant portion)

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ematics Deptt.
bi University, Patiala

Navpreet Singh
Chanehal

PAPER II : MATHEMATICAL METHODS- I

For Regular Students
Maximum Marks:50 Marks
University Exam: 40
For Distance Education Students/Private Students
Maximum Marks: 50 Marks (No Internal Assessment)

Maximum Time: 3 Hrs.
Teaching Hours: 50
Internal Assessment: 10

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and Section C will consist of one compulsory question having eight short answer type questions covering the entire syllabus uniformly. The weightage of Section A and B will be 60% and that of Section C will be 40%

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions in all selecting two questions from eachof the Section A and B and compulsory question of Section C.

SECTION-A

Laplace transforms:

Definition of Laplace transform, linearity property- Piecewise continuous function. Existence of Laplace transform, Functions of exponential order and of class A. First and second shifting theorems of Laplace transform, Change of scale property-Laplace transform of derivatives, Initial value problems, Laplace transform of integrals, Multiplication by t, Division by t, Laplace transform of periodic functions and error function; Beta function and Gamma functions. Definition of Inverse Laplace transform, Linearity property, First and second shifting theorems of inverse Laplace transform, Change of scale property, Division by p, Convolution theorem, Heaviside's expansion formula (with proofs and applications).

Naspaet Singh

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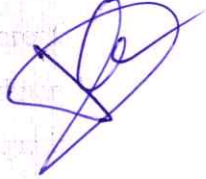
SECTION-B

Applications of Laplace transforms: Applications of Laplace transforms to the solution of ordinary differential equations with constant coefficients and variable coefficients, Simultaneous ordinary differential equations, Second order Partial differential equations (Heat Equation, Wave Equation and the Laplace equation).

Prescribed text Book:

1. Shanthi Narayan and P.K Mittal: Scope as in A course of Mathematical Analysisby, Published by S. Chand & Company,

2. A.R. Vasishtha & Dr. R.K.Gupta: Scope as in Integral transforms by Published byKrishna Prakashan Media Pvt. Ltd. Meerut.

for Head
Mathematics Deptt.
Punjabi University, Patiala

Option I. Discrete Mathematics- I

For Regular Students
Maximum Marks:50 Marks
University Exam: 40
For Distance Education Students/Private Students
Maximum Marks: 50 Marks (No Internal Assessment)

Maximum Time: 3 Hrs.
Teaching Hours: 50
Internal Assessment: 10

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and Section C will consist of one compulsory question having eight short answer type questions covering the entire syllabus uniformly. The weightage of Section A and B will be 60% and that of Section C will be 40%

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions in all selecting two questions from eachof the Section A and B and compulsory question of Section C.

SECTION-A

Principle of inclusion and exclusion. Computability and Formal Languages-Ordered Sets. Languages. Phrase Structure Grammars. Types of Grammars. Types of Grammars and Languages. Permutation. Combinations and Discrete Probability. Relations and Function- Binary Relations. Equivalence Relations and Partitions. Partial Order Relations and Lattices. Chains and Antichains. Pigeon Hole Principle

SECTION-B

Graphs and Planar Graphs-Basic Terminology. Multigraphs. Weighted Graphs. Paths andCircuits Shortest paths. Eulerian Paths and Circuits. Travelling Salesman Problem. PlanarGraphs. Trees.

RECOMMENDED TEXT

1. C. L. Liu, *Elements of Discrete Mathematics* (Second Edition), McGraw Hill, International Edition, Computer Science Series, 1986.

2. Dr. Babu Ram, Discrete Mathematics. Pearson Education India, 2012

REFERENCES

1. J. Glen Brookshear, *Computer Science: An Overview*, Addition-Wesley.

2. Stanley B. Lippyman, Josee Lojoie, *C Primer* (3rd Edition), Addison-Wesley.

Opt.-II : Probability Theory

For Regular Students
Maximum Marks 50 Marks
University Exam: 40
For Distance Education Students/Private Students
Maximum Marks: 50 Marks (No Internal Assessment)

Maximum Time: 3 Hrs.
Teaching Hours: 50
Internal Assessment: 10

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and Section C will consist of one compulsory question having eight short answer type questions covering the entire syllabus uniformly. The weightage of Section A and B will be 60% and that of Section C will be 40%

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions in all selecting two questions from each of the Section A and B and compulsory question of Section C.

SECTION- A

Concepts in Probability: Random Experiment, Trial, Sample Point and Sample Space, Events; Mutually Exclusive, Exhaustive, Independent and Equally Likely Events. Definition of the Probability; Classical, Relative Frequency Approach to Probability & their Demerits and Axiomatic Approach to Probability. Properties of Probability based on Axiomatic Approach, Conditional Probability, Bayes Theorem and its Applications.

SECTION- B

Random Variable: Definitions of Discrete Random Variables, Probability Mass Function, Continuous Random Variable, Probability Density Function. Illustrations of Random Variables and its Properties, Expectation of a Random Variable and its Properties, Moments, Measures of Location and Dispersion, Moment Generating Function and Probability Generating Function. Two Dimensional Random Variables –Joint, Marginal and Conditional Distributions (Concepts & Simple Applications) .

TEXT BOOKS

1. P.L. Meyer (2017). Introductory Probability and Statistical Applications, Oxford & IBH

2. Gun, A.M., Gupta, M.K., Dasgupta, B. (2016): Fundamentals of Statistics, Vol. I, World Press, Calcutta.

3. Mood A.M., Graybill F.A., and Boes D.C. (2017): Introduction to the Theory of Statistics, McGrawh Hill, 3rd Edition

Head
Mathematics Deptt.
Punjabi University, Pati

B.A/B.Sc.- VIth Semester

Paper-III:

Optimization Techniques

For Regular Students
Maximum Marks:50 Marks
University Exam: 40
For Distance Education Students/Private Students
Maximum Marks: 50 Marks (No Internal Assessment)

Maximum Time: 3 Hrs.
Teaching Hours: 50
Internal Assessment: 10

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and Section C will consist of one compulsory question having eight short answer type questions covering the entire syllabus uniformly. The weightage of Section A and B will be 60% and that of Section C will be 40%

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions in all selecting two questions from eachof the Section A and B and compulsory question of Section C.

Section-A

Inventory, Costs involved in Inventory, Variables in Inventory Models, Characteristics of Inventory Systems and Classifications, Concept of Economic Ordering (EOQ).

EOQ models with no shortage: Economic Lot Size system with uniform demand, Economic Lot Size with different rates of demand in different cycles, Economic Lot Size with finite rate of replenishment.

EOQ models with shortages: EOQ with constant rate of demand, Scheduling time constant and scheduling time variable, Production Lot size demand with shortages.
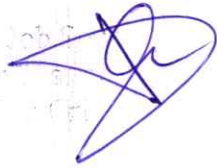
Section-B

Introduction to Job Sequencing: n jobs on two machines, m jobs on three machines, two jobs on m machines, n jobs on m machines.

Project Networks: Critical Path Methods, Project Evaluation and Review Techniques (PERT)

Recommended books:

1. Churchman: *Introduction to Operation Research*, J Wiley
2. C. Mohan, K. Deep: *Optimization Techniques* New Age International (P)
3. H.A Taha: *Operation Research* Pearson Education.
4. P.S Iyer: *Operation Research* Tata MacGraw Hill
5. S.D. Sharma: *Operation Research* Kedar Nath Ram Nath (India)
6. Kanti Swarup, P.K. Gupta, M. Mohan: *Operation Research* Sultan Chand and Sons, New Delhi.

Head
Mathematics Deptt.
Punjabi University, Patiala

Paper IV : MATHEMATICAL METHODS - II

For Regular Students
Maximum Marks: 50 Marks
University Exam: 40
For Distance Education Students/Private Students
Maximum Marks: 50 Marks (No Internal Assessment)

Maximum Time: 3 Hrs.
Teaching Hours: 50
Internal Assessment: 10

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and Section C will consist of one compulsory question having eight short answer type questions covering the entire syllabus uniformly. The weightage of Section A and B will be 60% and that of Section C will be 40%

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions in all selecting two questions from each of the Section A and B and compulsory question of Section C.

SECTION-A

Fourier series : Fourier series, Theorems, Dirichlet's conditions, Fourier series for even and odd functions, Half range Fourier series, Other forms of Fourier series

Hankel Transform : Hankel integral formula, Hankel transform, Inverse Theorem for Hankel transform, Hankel sine and cosine transforms and their inversion formulae. Linearity property of Hankel transforms, Change of scale property.

SECTION-B

Fourier transforms and its applications: Dirichlet's conditions, Fourier integral formula (without proof),Fourier transform, Inverse Theorem for Fourier transform, Fourier sine and cosine transforms and their inversion formulae. Linearity property of Fourier transforms, Change of scale property. Shifting theorem, Modulation theorem, Convolution theorem of Fourier transforms, Parseval's identity. Finite Fourier sine transform, Inversion formula for sine transform, Finite Fourier cosine Transform, Inversion formula for cosine transform. Applications to solve some model equations: One dimensional heat equation, one dimensional wave equation.
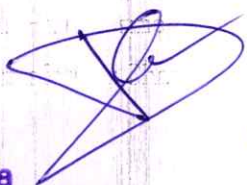
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jabi University, Patiala

Prescribed text Book:

1. Shanthi Narayan and P.K Mittal: Scope as in A course of Mathematical Analysisby, Published by S. Chand & Company,

2. A.R. Vasishtha & Dr. R.K.Gupta: Scope as in Integral transforms by Published byKrishna Prakashan Media Pvt. Ltd. Meerut.

Navhreet Singh

Chanchal

for Head
Mathematics Deptt.
Punjabi University, Patiala

Option III: Discrete Mathematics - II

For Regular Students
Maximum Marks:50 Marks
University Exam: 40
For Distance Education Students/Private Students
Maximum Marks: 50 Marks (No Internal Assessment)

Maximum Time: 3 Hrs.
Teaching Hours: 50
Internal Assessment: 10

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and Section C will consist of one compulsory question having eight short answer type questions covering the entire syllabus uniformly. The weightage of Section A and B will be 60% and that of Section C will be 40%

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions in all selecting two questions from eachof the Section A and B and compulsory question of Section

SECTION - A

Analysis of Algorithms-Time Complexity. Complexity of Problems. Discrete Numeric Functions and Generating Functions. Recurrence Relations and Recursive Algorithms Linear Recurrence Relations with Constant Coefficients. Homogeneous Solutions. Particular Solution. Total Solution. Solution by the Method of Generating Functions.

SECTION-B

Boolean Algebras-Lattices and Algebraic Structures. Duality. Distributive and Complemented Lattices. Boolean Lattices and Boolean Algebras. Boolean Functions and Expressions. Prepositional Calculus. Design and Implementation of Digital Networks. Switching Circuits.

RECOMMENDED TEXT

C. L. Liu, *Elements of Discrete Mathematics* (Second Edition), McGraw Hill, International Edition, Computer Science Series, 198

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OPTIONAL PAPER

Opt.-IV: Complex Variables

For Regular Students   Maximum Time: 3 Hrs.
Maximum Marks:50 Marks   Teaching Hours: 50
University Exam: 40   Internal Assessment: 10
For Distance Education Students/Private Students
Maximum Marks: 50 Marks (No Internal Assessment)

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and Section C will consist of one compulsory question having eight short answer type questions covering the entire syllabus uniformly. The weightage of Section A and B will be 60% and that of Section C will be 40%

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions in all selecting two questions from each of the Section A and B and compulsory question of Section C.

Section A

Polar forms of complex numbers, roots of complex numbers, Euler's formula, nth roots of unity, Vector interpretation and Spherical representation of complex numbers, Stereographic Projection and Complex Conjugate Coordinates. Inverse Functions, Transformations, Curvilinear Coordinates, Branch Point and Branch Lines, Riemann Surfaces, Derivatives.

Section B

Analytic Functions, Cauchy Riemann Equations, Harmonic Functions, Singular Points, Orthogonal Families, and the Complex Differential Operators, Simply and Multiply Connected Regions, Complex Line Integrals, Greens Theorem in the Plane, Cauchy's Theorem, Cauchy Goursat Theorem.
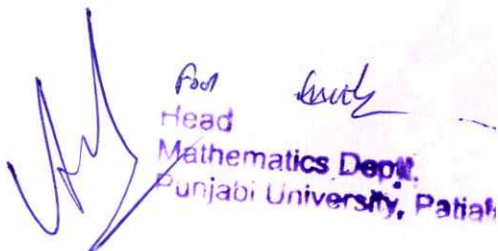
Recommended Text:

1. Complex Analysis (2nd Edition) – L. V. Ahlfors, McGraw-Hill International Student Edition, 1990.
2. An Introduction to the Theory of functions of a complex Variable – E. T. Copson, Oxford university press, 1995.
3. *Complex Variables* by Murray R. Spiegel, Schaum's Outline Series