MOHANLAL SUKHADIA UNIVERSITY, UDAIPUR

THIRD YEAR B.Sc. MATHEMATICS 2017-18

PAPER – I – REAL ANALYSIS

Duration: 3 Hours **Max. Marks: 75**

UNIT - I

Real number system:

(i) Field, ordered field, upper and lower bounds of a set in an ordered field. Superemum and infimum of a set and their properties. Completeness, Archimedean and denseness properties of an ordered field, the set Q of rational numbers as a non-complete dense. Archimedean ordered field and the set R of real numbers as a complete dense Archimedean ordered field,

(ii) Open interval, closed interval, neighbourhood of a number. Real line R-Interior points and limit points of a set in R, open sets and closed sets in R and their properties, Nested Interval property. Bolzano-Weierstrass theorem, Heine Boral theorem, Compact set and connected set and their properties.

UNIT - II

(i) Sequence, Bounded sequence, monotonic sequence, limit of a sequence, convergent sequence, properties of convergent sequence, Cauchy first and second theorems on limits, subsequence and it's properties, Cauchy sequence and it's properties, Cauchy general principle of convergence, Examples of convergent sequences.

(ii) Series: Convergence and divergence of an Infinite series of real numbers, the necessary and sufficient conditions, various tests of convergence problems and their illustrations with regard to infinite series of positive terms. Series: Alternating series and Leibnitz test, absolute and semi (or conditional) convergence.

UNIT-III

Riemann Integration: Upper and Lower Darboux sum, Upper and Lower Riemann integrals, Riemann integrability of a bounded function in a closed interval, the necessary and sufficient condition for R integrability in terms of Darboux sums, properties of R-integrable functions, Fundamental theorem of integral Calculus.

UNIT - IV

(i) Uniform convergence of sequences and series of functions, various tests including M_n-test and Weirstrass M-test, relations of uniform convergence with the continuity of the limit and the sum functions and also with term by term differentiation and term by term integration.

(ii) Fourier series representation of periodic functions which are even, odd and none of these in the full interval or half the interval.

UNIT - V

(i) Convergence of improper integrals - various tests and their applications, Evaluation of such integrals.

(ii) Equivalent sets and their examples, nature of the relations of equivalence. Denumerable and non numerable sets, countable and uncountable sets, Nature of subsets of a countable set and that of a denumerable (countable) sets, union of denumerable (countable) sets, Denumerability of the sets of integers and rational numbers and non denumerability of the closed unit interval [0, 1] and the sets of real numbers and irrational numbers.

References:

1. T. M. Apostol : Mathematical Analysis.
2. R. R. Goldbeg : Real Analysis
3. Walter Rudin : Principles of Mathematical Analysis
4. P.K. Jain& S. K. Kaushuik : An introduction to Real Analysis.
5. D. Somasundaram & B. Chaudhary : A First Course of Mathematical Analysis.
6. G. F. Simmon : Introduction to Topology.
7. Bhargava & Goyal : Real Analysis.
8. Gokhroo & others : Real Analysis.
9. Sharma & Purohit : Elements of Real Analysis.

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PAPER – II

ABSTRACT ALGEBRA

Duration: 3 Hours **Max. Marks: 75**

UNIT – I

Rings, definition and examples of various kinds of rings, integral domain, division ring, field, characteristic of a ring and integral domain, subring and subfield With examples. Left and right ideals with examples and properties, Principal ideal, principal ideal ring. Maximal, prime and Principal ideals in Commutative rings and their theorems.

UNIT -II

Quotient ring, Homomorphism and isomorphism in rings, kernel of homomorphism, Fundamental theorem of ring homomorphism. The three isomorphism theorems in rings, Embedding of a ring into a ring with unity and also into a ring of endomorphism of some abelian groups, Quotient field of an integral domain.

UNIT - III

Definition and various examples of vector spaces, subspaces and examples, Intersection, sum and direct sum of two subspaces, Linear span, Linear dependence, independence and their basic properties and problems.

UNIT- IV

Basis, Dimension and examples, Finite dimensional vector spaces, Existence theorem for a basis, Extension theorem, Invariance of the number of elements of a basis set, Existence of complementary subspaces of a subspace of a finite dimensional vector space, Dimension of sum (and direct sum) of two subspaces, Quotient space and its dimension.

UNIT - V

Linear transformations, Rank and Nullity of a linear transformation,Sylvester law of nullity, to obtain a matrix from a linear transformation and vice-versa and their problems relating to the same and different bases. The algebra of linear transformations, dual space and dual basis and dimension of dual space, bidual space and natural isomorphism (Reflexivity).

References:

1. Surjeet Singh and Quazi Zarneeruddin : Modern Algebra.
2. I.N.Herstein : Topics in Algebra.
3. R.S.Agrawal : Algebra.
4. Gokhroo, Saini : Advance Abstract Algebra.
5. Shanti Narayan : A Text-Book of Modern Abstract Algebra.
6. Hoffman and Kunze : Linear Algebra, (Second Edition).
7. Purohit, Pareek and Sharma : Linear Algebra.
8. Halmos, Paul R : Finite - Dimensional Vector spaces.

Paper –III (Optional): Any one of the following papers –

THIRD YEAR B.Sc. MATHEMATICS 2017-18

PAPER -III (A)

DISCRETE MATHEMATICS

Duration: 3 Hours **Max. Marks: 75**

UNIT – I

Sets and propositions – cardinality, Mathematical Induction, Principle of Inclusion and exclusion. Computability and formal language- ordered set. Language phrase structure Grammars. Types of Grammars and languages. Permutation and combinations: Simple problems.

UNIT –II

Relations and functions:- Binary Relations, Equivalent Relations and Partitions, Partial order relations and lattices, Pegeon Hole principle. Graphs and planar graphs: - Basic Terminology; Multigraphs, weighted graphs, paths and circuits shortest paths. Eulerian paths and circuits. Planar graphs.

UNIT – III

Trees: Rooted trees, Binary tree, Decision or sorting tree, spanning tree, minimal spanning tree. Pumping lemma. Finite state machine: Equivalent machines, Finite state machine as Recognizers. Analysing Algorithms– Time complexity, complexity of problems.

UNIT –IV

Recurrence Relations and Recursive Algorithms: Linear Recurrence Relations with constant coefficients, Homogeneous solutions, Particular solution, Total solution, Solution by the method of generating functions.

UNIT – V

Brief review of groups and Rings. Boolean Algebras – Lattices and Algebraic structures. Duality, Distribution and complemented Lattices, Boolean Lattice and Boolean Algebras, Boolean function and expressions, Propositional calculus, Design and Implementation of Digital network - Switching circuits.

References:

1. C.L. Liu : Elements of Discrete Math emetics
2. K.D. Joshi : Foundation of Discrete Mathematics
3. Mradula Garg & R. Panday : fofoDr xf.kr
4. Gokhroo et.al : fofoDr xf.kr

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PAPER- III (B)

NUMERICAL ANALYSIS AND OPERATIONS RESERCH

Duration: 3 Hours **Max. Marks: 75**

UNIT - I

Differences, Relation between differences and derivatives, differences of Polynomial, Newton-Gregory formula for forward and backward interpolation, divided differences. Newton's General interpolation formula, Lagranges's interpolation formula.

UNIT - II

Gauss's central difference formula, Stirling's and Bessels interpolation formula, Inverse interpolation. Numerical differentiation, Derivatives from Interpolation formulae, Method of operators, Numerical Integration: Newton-cotes Quadrature formula, Trapezoidal, Simpson's one third, Simpson's three-eight rules.

UNIT-III

Gauss Quadrature formulae, Estimation of errors in quadrature formula, location of roots by Descarte's method of sign, Newtons theorem on multiple roots, Numerical solution of Algebraic and Transcendental equations, Bisection method, Regula-Falsi method, Method of integration .

UNIT-IV

Introduction to linear programming problems, Mathematical formulation Graphical method of solution of linear programming problems (Problems of two variables only), Theory of convex sets, Theory of Simplex method and its applications to simple linear programming problems.

UNIT - V

Concepts of duality in linear programming, formation of dual problems, Elementary theorems of duality. Assignment and transportation problems and their optimum solutions.

References:

1.	C. E. Froberg	: Introduction to Numerical Analysis
2.	M. K. Jain, S. R. K. Iyenger and R.K. Jain	: Numerical methods: Problems & solutions
3.	G. Hadley	: Linear Programming
4.	Kanti Swaroop, P. K. Gupta and Man Mohan	: Operation Research
5.	H.C. Saxena	: Numerical Analysis
6.	Goyal, Mittal	: Numerical Analysis
7.	Goyal, Mittal	: Numerical Analysis (Hindi ed.)
8.	Goyal, Mittal	: Numerical Analysis (Hindi ed.)
9.	Goyal, Mittal	: Operations Research
10.	S.D.Sharma	: Operations Research
11.	Gokhroo, Saini, Jain	: Operations Research (Hindi ed.)
12.	Bhargava, Bhati, Sharma	: Linear Programming (Hindi ed.)
13.	Gokhroo, Saini, Jain	: Linear Programming (Hindi ed.)

THIRD YEAR B.Sc. MATHEMATICS 2017-18

PAPER- III(C)

MATHEMATICAL STATISTICS

Duration: 3 Hours **Max. Marks: 75**

UNIT -I

Probability: Definitions of Probability, Addition and Multiplication laws, Conditional probability , Independent events, Baye's Theorem.

UNIT II

Random variable, Distribution function, Probability mass & density functions, probability distribution, Joint, marginal and conditional probability functions.

UNIT –III

Mathematical expectation and Moments, Addition & Multiplication law, Covariance, Expectation and Variance of linear combination of two variables, Moment generating, cumulant generating & characteristic functions.

UNIT –IV

Theoretical Probability distributions- Binomial, Poisson and Normal distributions and their properties.

UNIT –V

Curve fitting by the principle of least squares, fitting of straight line and parabola, Bivariate linear correlation and regression.

Books Recommended:

1. Mathematical Statistics, J. N. Kapur & H.C. Saxana, S. Chand & Co., New Delhi.
2. Fundamentals of Mathematical Statistics, V. K. Kapoor & S.C. Gupta, Sultan Chand & Sons, New Delhi.
3. Mathematical Statistics by Dr. Gokhroo & Saini.

NOTE:

Candidates who have offered Statistics as an optional subject will not be permitted to offer the paper III (B) and III (C). Candidates who have offered Computer science as an optional subject will not be permitted to offer paper III (B).