Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur (C.G.)

Scheme and Syllabus

of

M.A/M.Sc. (Maths) Previous/Final

Program Code: MAMSCMATHP115

Annual System for Affiliated College

(As Per LOCF and Credit System)

w.e.f. 2024-25/2025-26

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COMPULSORY
PAPER – I
ADVANCED ABSTRACT ALGEBRA

introduction- Permutation group, Normal Subgroup, Revisited Normaliser and commutator subgroup, three isomorpsm theorem, Correspondence theorem, Maximum Normal Subgroup, Automorphism and Inner Automorphism, centre of group.

Normal Series, Normal and Subnormal series, Composition series Jordan Holder theorem, Solvable group Nilpotent group.

Ring and Ideals - Definitions, Maximum and prime Ideals·, Nilpotent and Nil Ideals zorn's Lemma (Statement Only) its application to obtain maximal ideals.

Modules and vector space - Definition and examples sub modules, quotient modules, Direct, sums, Modules generated by a set R Homomorphism of Modules, isomorphism theorem, exact sequence of modules, short exact sequence, cyclic modules, simple modules. semi simple modules schure's Lemma, free modules Representc3tion of Lin-ear mapping, Rank of Linear mapping, Rank Nullity theorem.

Field Theory - Extension field, Algebric and transceddental extension, seperable and inseperable extension, Normal extension perfect field finite field, premitive elements, Algebrically closed field, Aulomorphism of extension, galois extension, fundamental theorem of Galois theory.

Canonical Form -Similarity of Linear transformation invarient sub spaces 8eduction to triangular form, Nilpotint transformation, Primary decomposition theorem ,Jordon blocks and Jordan Form. Noeitherian an Artinian modules and rings, Hilberts basis theorem wedderbum theorem.

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COMPULSORY
PAPER– II
REAL ANALYSIS & MEASURE THEORY

Definition and existence of Riemann - stieltjes integral, Properties of the Integral, Integration and differentiation, the fundamental theorem of Calculus, Integration of vector - valued functions Rectifiable curves.

Rearrangements of terms of a series, Riemann's theorem

Sequences and series of functions, point wise and uniform convergence. Cauchy criterion for uniform convergence, Weierstrass M-Tests, Abel's and Dirichlet's tests for uniform convergence uniform convergence and continuity, uniform. convergence and Riemann - Stleltjes integration uniform convergence and differentiation , Weierstrass approximation theorem, Power series uniqueness theorem for power series, Abel's and Tauber's theorems.

Functions of several variables, linear transformations, Derivatives in an open subset of R Chain rule, Partial derivatives, interchange of the order of differentiation, derivatives of high orders, Taylors theorem, Inverse function theorem, Implicit function theorem, Jacobians, extreme Problems with constraints. Lagrange's multiplier method, Differentation of integrals, Partitions unity, Differential forms, Stoke's theorem. Lebesgue outer measure, measurable set Borel and lebsgue measurability Non measurable set measurable function.

Reiman and Lebesque Integral, Integration of non - negative function, the general Integral, Integration of series.

Theory of Differentiation and integration, The Four – derivatives function of Bounded variations.

Measure and outer measure Extension of a measure: Uniqueness of extension on completion of measure, measure spaces, integration with respect to a measure.

The L^P Spaces , convex function, Jardon,s Inequality. Holder and Minkowski Inequality completness of L^P.

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COMPULSORY
PAPER- III
TOPOLOGY

Definition and examples of topological spaces. Closed sets Closure, Dense subsets. Neighbourhoods interior exterior and boundary. Accumulation points and derived sets. Bases and sub - bases. Subspaces and relative topology.

Alternate methods of defining a topology in terms of Kuratowski Closure Operator and Neighbourhood Systems.

Continuous Functions and homeomorphism.

First and Second Countable spaces. Lindelof;s theorems. Separable spaces. Second Countability and Separability.

Separation. axioms T**0**,T**1,** T**2,** T**3,...** T**4**_**:** Their Characterizations and basic properties. Uryhohn's lemma Tietze extension theorem.

Compactness- Continuous functions and compact sets. Basic properties of compactness Compactness and finite intersection property. Sequentially and countably compact sets. Local compactness and one point compactiflcation, Stone - vech compactification. Compactness in metri spaces. Equivalence of compactness countable compactness and sequential compactness in metric spaces.

Connected spaces. Connectedness on the real line .Components Locally Connected spaces.

Tychon off product topology in .terms of standard sub - base and its characterizations projection maps. Separation axioms and product spaces. Connectedness and product spaces. Compactness and product spaces (Tychonoff's Theorem.) Countability and product

Spaces. Embedding and metrization Embedding lemma and Tychonoff embedding, the urysohn metrization Theorem.

Nets and filters. Topology and_ convergence of nets. Hausdorffness and nets. Compactness and nets. Filters and Their convergence, Canonical way of converting nets to filters and vice- verse. Ultra– filters and Compactness

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COMPULSORY
PAPER IV
COMPLEX ANALYSIS

Complex Integration. Cauchy-Goursat. Theorem. Cauchy's integral Formula. Higher order derivatives. Morera's Theorem. Cauchy's inequality and Liouvile's theorem. The fundamental theorem of algebra. Taylor's theorem. Maximum modulus principle Schwarz Lemma. Laurent's series. Isolated singulartities. Meromorphic functions. The argument

principle. Rouche's theorem Inverse function theorem.

Residues. Cauchy's residue theorem. Evaluation of Integrals.

Bilinear transformations. their properties and classifications. Definitions and examples of conformal mappings.

Spaces of analytic functions. Hurwitz's theorem, Montel's theorem Riemann mapping theorem.

Weierstrass factorisation theorem. Gamma function and its properties Riemann Zeta function. Riemann's functional equation. Runge's theorem **,**Mittag - Leffler's theorem Analytic Continuation. Uniqueness of direct analytic continuation. Uniqueness of analytic continuation along a curve. Power series method of analytic continuation Schwarz Reflection principle Monodromy theorem and its consequences. Harmonic functions on a disk. Harnak's inequality and theorem. Diriclet problem. Green's function.

Canonical products. Jensen's formula. Poission– Jensen's formula. Poission–Jensen

formula. Hadamard's three circles theorem. Order of an entire function. Exponent of Convergence. Borers theorem. Hadamard's factorizaticm theorem.

The range of on analytic function. Bloch's theorem. The little Picard theorem. Schottky's theorem. Mantel Caratheodory and the Great picard theorem.

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OPTIONAL
PAPER- I
ADVANCED DISCRETE MATHEMATICS

Formal Logic- Statement and Notation, Conectives- Negation, conjunction Disjunction, Truth Table, Conditional and Bioconditional, statement well formed formula, Tautology, Equivalent formula, Duality Lan functionally complete set of connectives, two state Divices and statement logic, Normal form, Principle conjuctives and Principle Disjunctive, Normal forms, The theory of inference for the statement, calculus, Rules of Inference, Automatic theorem proving, the predicate calculus, Quantifiers, Predicate formulas, Free and Bound variables Inference theory of predicate calculus, valid formulas, over finite Univers, valid formulas, involving quantifiers formulas Involving more than one quantifiers.

Algebric Structure- Algebric system, semigroup and Morlods, Definition and examples (Including these pertaining to conetenation operation) Homomorphism, of semigroup and monoids, congruence relation and quotient semigroups, subsemigroup and submonods, Direct product Basic Homomorphism theorem.

Lattices– Lattice as partial ordered sets their properties, Lattice as Algebric, system. sublattice, Direct Product and Homomorphism, Complete, Complemented, and Distributive lattice.

Boolean Algebras- Boolean Algebra as lattice, varies Boolean Identities The swicting Algebra, subAlgebra, Direct Products and Homomorphism Join - Irreducible Elements, Atom and MInterm, Boolean form and their Equivalence Minterm Boolean forms, sum of products,
and products of sum canoncial forms MlniMization Boolean function, Application of Boolean Algebra, Swiching Theory (Using ANO ,OR and NOT Gates)

Grammer and Language -Phrase Structure Grammer, Rewriting Rules Derivation, Sentential forms, context-sensetive context. Free and Regular grammers and Language Notation of syntext, Analysis, Polish Notation, Conversion of Infix experience to polish Notation the rename polish Notation.

Introductory Computability Theory - Finite state machines and their transition Table Diagrams, Equivalence of finite state machines, Reduced Machines. Homorphism. Finite Automata Acceptiors, Non Deterministic Finite Automata and equivalence of its power to that of Deterministic Finite Automata.

Graph Theory -Definition of (Undirected) Graphs, Paths, Circuits Cycles & Subgraphs Induced, subgraph, Degree of vertex. Connectivity, Planer I Graphs and their properties. Trees, Euler's formula for connected Planner Graphs. Complete and complete Bipartite graphs, Kurotowikis Theorem (Statement Only) and its use. Spanning trees, Cut sets, Fundamental cut sets and cycles. Minimal Spanning Trees, Matrix. Representation of Graphs. Euler's Theorem on the Existence of Eulerian Paths Directed Graphs, In degree and out degree of a vertex Weighted undirected Graphs.

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OPTIONAL
PAPER– II
DIFFERENTIAL GEOMETRY OF MANIFOLDS

Definition and examples of differentialble manifolds. Tangent spaces jacobian map. One parameter group of transformation, Lie. derivatives. Immersions and imbeddings. Distribution exterior algebra. Exteriort derivative.

Topological groups. Lie groups and lie algebras, Product of two. Liegroups. One parameter subgroups and exponential maps. Examples of Liegroups. Homomorphism and isomorophism. Lie Transformation Groups. General linear groups. Principal fibra bundle. Linear frame bundle. Associated fibre bundle. Vector bundle. Tangent bundle. Induced bundle.' Bundle homomorphisms.

Riemann ion manifolds. RiemaMian connection Curvature tensors. Sectional curvative Schur's theorem. Geodesics in a Riemannian manifold. Projective curvature tensor. Conformal curvature tensor.

Submanifolds & hypersurfaces Normals. Gauss's fomulae Weingarten equations Lines of curvature, Generalized Gauss and Mainard-Codozzi equations.

Almost complex manifolds. Nijenhuis tensor. Contravariant and covariant almost analytic vector field F - Connection.

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MASTER OF SCIENCE

1. The examination for the degree of Master of Science consist of 2 parts
   (A) The Previous examination and
   (B) The Final Examination.

2. A candidate who after obtaining the degree of Bachelor of science the University or an examination of any statutory University in any statutory University in India which has been recognised by they University as equivalent to B.Sc. degree of the university and has completed a regular course of study in the teaching department of the University in the subject in which he offers himself for examination for one academic year shall by admitted to the previous examination for the degree of master of Science.

   Provided however every candidate shall offer for the Previous Examination one of the subjects offered by his/her B.Sc. Degree.

   Provided further (i) for admission of M.A. /M.Sc. Final (Maths) and candidate must have offered Maths as one of the subject in B.Sc. (ii) for admission in M.A./ M.Sc. Final (Maths) preference will be given to those candidates who offered Maths as one of their subject in B.Sc.

3. A candidate who after passing the M.Sc. Previous Examination of the University has completed a regular course of study for one academic year in a teaching department of the University or in a College affiliated to the University shall be admitted to the Final Examination for the degree of Master of Science in the subject in which he/she has passed the Previous examination.

   A Candidate who has passed the previous examination for the degree of Master of Science of another University may also be admitted to the final Examination for the degree of Master of Science after obtaining necessary permission from the Kulpati, provided that he offered for his previous Examination a course of study of an equivalent standard with almost identical syllabus as is required for the Previous Examination of this University, and has attended a regular course of study for one academic yea. in a College affiliated to the University teaching department of the University.

4. The examination shall be partly be meant of paper and partly practical including Sessional, except in the case of mathematical where the examination shall be paper only.

5. Besides regular students and subject to other compliance with this ordinance, ex-students and non collegiate candidates shall be eligible for admission to the examination as per provision or ordinance No.6 relating to Examination (General).

   Provided that non-collegiate candidate shall be permitted to offer only such subjects/papers as are taught to the regular students at any of the University teaching Department or College.

6. The Subject of the Examination .shall be of the following :
   (i) Mathematics (ii) Physics (iii) Chemistry
   (iv) Zoology (v) Botany (VI) Geology

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A candidate who has passed the M.Sc. Examination of the University many subject shall be allowed to present himself for the M.Sc. Examination in any one of more of the optional papers in the subject not taken by him at the said examination and if successful will be given a certificate to that effect.

7. From the session 1986-87 for the Previous Examination, candidate must obtain for a pass at leasst 32% in each theory and Practical and 36% of the aggregate marks in the Theory paper and Practical separately in each examination. The above provision of 20% in each paper shall be applicable for Final Examination from the academic session of 1987 -88

8. No division will be assigned on the result of the Previous Examination the division in which a candidate is placed shall be determined on the basis *of* aggregate *of* marks obtained in both. The M. Sc. Previous and M.Sc. Final Examination.

9. Successful candidates who obtain 60% or more of the aggregate marks shall be placed in the first Division, those obtaining less than 60% but not less 48% in the second Division and all other success full candidate obtaining less than 48% in the Third Division.

10. Candidates who have passed the M.Sc. Examination of the University in any subject in Third or Second Division and desire to appear at the M.Sc. Examination in the same subject for improving division without attending a regular course of study in a College affiliated to the University or in a Teaching Department of the University be allowed to appear at the afo.res□id examination as non-collegiate student on the following conditions.

    (i) There shall be only two Divisions. for such candidates the First these division shall be the same as prescribed in the ordinance i.e. examinees who are successful in Final of the Examination. and have obtained 60% or more aggregate of the marks in Previous and Final Examination taken together shall be placed in the First Division and Examinees who are successful in Final Examination and have obtained less than 60% but not less than 48% of aggregate marks in previous and Final examination taken together shall be placed in the Second. Division.

    (ii) The result of the candidates obtaining less than 48% of the aggregate marks in previous and Final Examination taken together shall not be declared.

    (iii) Candidates shall have the option to appear at both the previous and final examination in one and the same year and for being successful at the examination, the candidates shall obtain 48% of the aggregate marks.

    Provided that such candidates who opt to appear in previous and final examination separately shall have to obtain minimum aggregate required for the previous examination but he will have to obtain at least 48% in the aggregate of previous and final examination taken to gather or else his result will be cancelled.

    (iv) The syllabus for the examination shall be same as prescribed for the year in which the examination held.

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(v) Not more than to attempt shall be allowed to such a candidate. Failure *of* appearance at the examination after per permission has been accorded by the University shall be counted as an attempt.

Provided however: such candidates who to appear at the previous and final examination separately will be allowed only one attempt of the previous examination and two attempts as the final examination.

(VI) Candidates who wish to avail the opportunity given in fore going .Paper will have to apply for permission as required in the Ordinance relating to admission of non - collegiate students to the University examination along with registration fee.

(vii) In case, a student Improves his division under provision of this Para, the fresh Degree will be issued after cancelling his first Degree.

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COMPULSORY
PAPER- I

Integration Theory

Signed measure Hahn decomposition theorem, mutually singular measures, Radon-Nikondym Theorem, Labesgue decomposition, Rises representation theorem. Extension theorem (Caratheodory) Lévesque satieties integral, product measures, Fubini's theorem. Differentiation and Integration. Decomposition into absolutely continuous and singular parts.

Baire sets. Baire measure, continuous functions with compact support. Regularity of measure on locally compact spaces.

Functional Analysis

Normed Linear spaces Banach spaces and examples Quotient space of normed linear spaces and its completeness equivatient norms Lemma. basic properties of finite dimensional normed linear spaces and compactness. Weak convergence and bounded linear transformations normed linear spaces of bounded linear transformations dual spaces with examples Uniform roundedness theorem and some of its consequences. Open mapping and closed graph theorems Hahn –Banach theorem for real linear spaces complex linear spaces and normed linear

spaces. Reflective spaces Weak Sequential Compactness Compact operators. solvability of linear Equations in Banach spaces- The closed

Range Theorem.

lnner Product spaces. Hilbert spaces. Orthonormal Sets Bessel's inequality. Complete orthonormal sets and Parseval's identify Structure of Hibert spaces. Projection theorem Rises presentation theorem Ad joint of an operation a Hilbert space. Reflexivity of Hilbert spaces

Self adjoin operators, Positive, projection, Normal and unitary operators.

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COMPULSORY
PAPER- II
PARTIAL DIFFERENTIAL EQUATIONS, MECHANICS & GRAVITATION

Partial Differential Equations Examples of PDE. Classification.
Transport Equation– Initial Value problem Non- homogeneous Equation.
Laplace's Equation- Fundamental Solution. Mean Value Formulas Properties of Harmonic Functions, Green's Function, Energy Methods.
Heat Equation- Fundamental Solution Mean Value Formula, properties of Solutions, Energy Methods.
Wave Equation Solution by Spherical means, Homogeneous Equations, Energy Methods.
Nonlinear First Order PDE, Complete Integrals, envelopes, Characteristics, Hamilton Jacobi Equations (Calculus of variations, Hamilton's ODE, Legendre Transform, Hopt-Lax Formula, Weak Solutions, Uniqueness,) Conservation Laws(Shocks Entropy Condition Lax–Oleinik Formula Weak Solutions, Uniqueness, Riemann's problem Long Time Behaviour)
Representation of Solutions- Separation of Variables, Similarity Solutions (Plane and Travelling Waves, Solutions Similarity under Scaling) Fourier and Laplace Transforms, Hopf -cole transform, Hodograph and Legendre Transforms, Potential Functions, Asymptotic (Singular Perturbations Laplace's method, Geometric Optics, Stationary Phase, Homogenization), Power Series (Non characteristic Surfaces Real Analytic Functions, Caucky - Kovalevskaya Theorem.)

MECHANICS
Analytical Dynamics
Generalized coordinates. homonymic and Non– holonomic systems. Scieronomic and Rheonomic systems. Generalized potential Lagrange's equations of first kind. Lagrange's equations of second kind Uniqueness of solution, Energy equation for conservative fields.
Hamilton's variables, Donkin's theorem, Hamilton canonical equations, Cyclic coordinates. Routh's equations, Poisson's Bracket Poisson's identity. Jacobi-Poisson Theorem. Motivating problems of calculus of variations, Shortest distance minimum surface of revolution. Brachistochrone problem. Isoperimetric problem. Geodesic. Fundamental lemma of calculus of variations, Euler's equation for one dependent Function and its generalization to (i) Independent functions, (ii) higher order derivatives. Conditional extremum under geometric constraints and under integral constraints.

Gravitation.
Attraction and potential of rod, disc, spherical shells and sphere, Surface integral of normal attraction (application & causes, theorem,) Laplace and Poisson equations, Work done by sell attracting systems, Distributions for a given potential. Equipotential surfaces. Surface and solid harmonics Surface density in terms of surface harmonics.

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OPTIONAL
PAPER– I
FUNDAMENTALS OF COMPUTER SCIENCE & DATA STRUCTURE

Note: Five question out of 10 questions to be attempted.

Computer Basics introduction to computers with characteristics and their uses, Structure of computers, Micro, Mini and Mainterme computer, Data representation, Numbering system and their arithmetic, Fixed point and flothing point representation of overflow and underflow conditions using 7-bit and 8-bit registers, Error detection and correction codes

Input devices and computer Memory Description of various input/ output units of computers, VDU, OMR, OCR, Bas coding, Memory organization, Memory cells, Read only memory serial access memory Physical devices used to construct memory.

Computer architecture and operating system lnter-connection of units, Memory of processor, l/O to processor communication, interrupt,- objectives of an operating system Function of an operating system, types of an operating system- batch, multiprogramming, online and real time operating system.

Computer and communication : Computer Network technology, Communication protocols, Different topologies Linear Circular sates, tree concept of LAN, WAN, MAN concept of Repeater, Bridge, Router, Gate way, Modern FTP, Electronic – mail UseNet

Concept of Data - structive, Type and operations, Algorithms, complexity Time, space, Trade off. Linked List: Representation, Travesing, searching instruction into a linked list (First, mid & last position with algorithm) deletation stacks, dueues, Recunsion, Array representation of-stacks, Arithmetic expressions (Polish Notation) Application recession and queues.

Trees - Binary trees, representation, traversing, binary search trees, searching and inserting in Binary search. Deleting in a Binary search tree General tree.

Sorting: Insertion, quick, heap, bubble & merge, selection sort

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OPTIONAL
PAPER– II
1. PROGRAMMING IN C (WITH ANSL FEATURES)

An overview of programming. Programming language, Classification.

C Essentials- Program Development. Functions. Anatomy of a Function. Variables are Constas Expressions. Assignment Statements. Formatting Source Files. Continuation Characis. The Pre-processors.

Scalar data types Declarations, Different types of integers Different kinds of Integer constants Floating point types, Initialization, Mixing Explicit conversions.

Casts, Enumeration types, The void data type, Typesets, Finding the address of an object Pointers, control Flon-Conditional Branching, The switch statement Looping Nested Loops The Break and continue statements. The go to statement Loops; while loop, for loop break loop, do…..while loop, The it statement the it …… else……. Statement)

Operators and Expressions Precedence & Associatively, Unary Plus and Minus operators. Binary Arithmetic Operators, Arithmetic Assignment Operators, Increment and Decrement operators, comma operators, Relational operators, Logical Operators Bit – Manipulation operator, Bitwise Assignment Operators. Cast operator. Size of operators. Conditional Operators Memory Operators.

Arrays and Pointers-Declaring an Array. Arrays and memory, Initializing arrays. Elements through Pointers. Passing Arrays as Function Argument. Sorting Algorithms. Strings. Multidimensional Arrays of Pointers to Pointers.

Storage Classes-Fixed vs. Automatic Duration. Scope Global variables. The register Specified ANSI rules for the syntax and Semantics of the storage class keywords. Dynamic Memory Allocation.

Structures and Union- Structures. Linked Lists. Union's enum Declarations.

The C Pre-processors-Macro substitution. Conditional Compilation. Include Facility. Line Control input and Output-Streams, Buffering. The <Stdio.h> Header file Handing. Opening and Closing File. Reading and Writing Data Selecting an I/O Method. Unbufferered I/O Random access. The standard library for input/output.

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Optional
Paper – V

Introduction, Difference calculus-The Difference Operator, Summation, Generating functions and approximate summation

Linear Difference Equations- First order equations. General results for linear equations. Equations with constant coefficients. Applications, Equations with variable coefficients Non Linear equations that can be liberalized. The z-transform.

Stability Theory– Initial value problems for linear systems stability of linear systems. Stability of nonlinear systems. Chaotic behaviour.

Asymptotic methods- introduction, Asymptotic analysis of sums Linear equations. Nonlinear equations.

The Self- Adjoint second order linear equation, Introduction. Sturmian theory Green's functions, disconjucqacy, The Riccati Equations. oscillation

The Sturm- Liouville problems introduction, Finite Fourier Analysis A Non-Homogeneous Problem.

Discrete Calculus of Variations- Introduction Necessary conditions, Sufficient Conditions and Disconjugacy.

Boundary Value problems for Non-linear equations- introduction The Lipschiz case, Existence of Solutions. Boundary Value Problems for Differential Equations.

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OPTIONAL
PAPER– VI
FLUID MECHANICS

Kinematics– Lagrangian and methods, Equation of continuity. Boundary surface. Stream lines. Path lines and streak lines. Velocity potential. Irrigational motions. Vortes lines.

Equations of Motion – Lagrange's and Euler's equation of motion. Bernoulli's Theorem. Equation of motion by flux method equations referred to moving axes. Impulsive actions. Stream function. Irrigational motion in two dimensions. Complex velocity potential. Sources. Sinks, doublets and their images, Conformal mapping mine – Thomson circle theorem.

Two dimensional irrigational motion produced by motion of circular coaxial and elliptic cylinders in an infinite mass of liquid kinetic energy of liquid, Theorem of Blasius. Motion of a sphere through a liquid at rest at infinity. Liquid streaming past a fixed sphere. Education of motion of a sphere. Stokes stream function

Vertex motion and its elementary properties Kelvin's proof of permanence Motions due to circular and rectilinear vortices Wave motion in a gas. Speed of sound, Equation of motion of a gas. Subsonic sonic and supersonic, Flows of a gas. Isentropic gas flows. Flow through a nozzle. Normal and oblique shocks

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OPTIONAL
PAPER – VII
INFORMATION THEORY

Measure of Information– Axioms for a measure of uncertainty. The Shannon entropy and its properties. Joint and conditional entropies. Transformation and its properties.

Noiseless coding – Ingredients of Noiseless coding problem. Uniquely decipherable codes. Necessary and sufficient condition for the existence of instantaneous codes. Construction of optimal codes.

Discrete memory less Channel Classification of channels information processed by a channel. Calculation of channel capacity Decoding schemes. The ideal observer. The fundamental theorem of information theory and its strong and weak converses.

Continuous Channels– The Time discrete Gussian channel Uncertainly of an absolutely continuous random variable- The converse to the coding theorem for time discrete Gaussian channel. The Time continuous Gaussian channel Band – limited channels.

Come imuitive properties of a measures of entropy– symmetry. Normalization, expansibility boundedness recursively, branching etc. and interconnections among them Axiomatic characterization of the Shannon entropy due to Shannon and faded.

Information functions, the fundamental equation of information, information functions continuous at the origin, nonnegative bounded information functions measureable information functions and entropy Axiomatic characterization of the Shannon entropy due to Tverberg and leo. The general Solution of the fundamental equation of information. Derivations and their role in the study of information function.

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OPTIONAL
PAPER– VIII
OPERATIONS RESEARCH

Operation Research and its Scope necessity of Operations Research in Industry.

Linear Programming- Simplex Method. Theory of the Simplex Method. Duality and Sensitivity Analysis.

Other Algorithms for Linear Programming. Dual Simplex method. Parametric Linear Programming Upper Bound Technique. Interior Point Algorithm. Linear Goal Programming.

Transportation and Assignments Problems.

Network Analysis Shortest Path Problem. Minimum Spanning Tree Problem maximum Flow Problem Minimum Cost Flow Problem Network Simplex Method Project Planning and Control with PERT-CPM.

Dynamic Programming Deterministic and Probabilistic Dynamic programming.

Game Theory- Two Pe6dn Zero -Sum Games. Games with Mixed Strategies Graphical Solution .Solution by Linear Programming integer Programming Branch and Bound Technique.

Application to Industrial Problem- Optimal product mix and activity levels. Petroleum refinery operations. Blending problems Economic Interpretation of dual Linear programming problems. Input/output analysis. Leontief system. Indecomposable and Decomposable economies.

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OPTIONAL
PAPER– IX
FUZZY SETS AND THEIR APPLICATION FOR ANNUAL COURSE

Fuzzy Sets Basic definitions α (Alpha) level sets. Convex fuzzy sets. Basic operation on fuzzy sets.

Types of fuzzy sets. Cartesian products. Algebraic products Bounded sum and differenced. T-norms and t- conorms.

The Extensions Principle. The Zadeh's extension principle. Image and inverse image of fuzzy sets fuzzy numbers. Elements of fuzzy arithmetic.

Fuzzy Relations and Fuzzy Graphs – Fuzzy relations on fuzzy sets. Composition of fuzzy relations Min – Max composition and its properties. Fuzzy equivalence relations. Fuzzy compatibility relations Fuzzy relation equations Fuzzy graphs. Similarity relation.

Possibility Theory – Fuzzy measures. Evidence Theory. Necessity measure. Possibility measure. Possibility distribution. Possibility theory and fuzzy sets. Possibility theory versus probability theory.

Fuzzy Logic – An overview of classical logic. Multivalve logics. Fuzzy propositions. Fuzzy qualifiers. Fuzzy qualifiers. Linguistic variables and hedges. Inference from conditional fuzzy propositions. The compositional rule of inference.

Approximate Reasoning – An overview of fuzzy expect system. Fuzzy implications and their selection. Multiconditional approximate reasoning. The rule of fuzzy relation equation.

An introduction to fuzzy control – Fuzzy controllers, Fuzzy rule base, Fuzzy inference engine. Fuzzification. Defuzzication and the various defuzzication method (The centre of area, the centre maxima, and the mean of maxima methods.)

Decision Making in Fuzzy Environment – Individual decision making. Militiaperson decision making. Multicritria decision making, Multistage decision making Fuzzy ranking methods, Fuzzy linear programming.

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