M.G.S. UNIVERSITY, BIKANER

SYLLABUS

SCHEME OF EXAMINATION AND COURSES OF STUDY

FACULTY OF ARTS / SCIENCE

M.A. MATHEMATICS

M.A. Final Examination-2017

NOTICE

1. The Ordiances Governing the examination in the Faculties of Arts, Fine Arts, Social Sciences, Science, Commerce, Management, Engineering, Education and Law are contained in separate booklet. The students are advised to the same.
2. Changes in Statutes / Ordinances / Rules/ Regulations / Syllabus and Books may from time to time, be made by amendment or remaking, and a candidate shall, except in so far as the University determines otherwise comply with any changes that applies to years he has not completed at the time of change.
3. In each paper, 9 questions will be set, 3 questions from each section. Candidates have to answer five questions in all taking at least one question from each section.
4. The syllabus is given in both the languages i.e. Hindi & English, if there is any discrepency, English version will be authentic.
5. The list of text books/ Recommended books/Reference Books as approved by the various B.O.S. are printed along with the English version only.

Note : The decision taken by the Academic Council shall be final.

lwpuk

1- कला, ललितकला, सामाजिक विज्ञान, विज्ञान, वाणिजय, प्रबन्धन अभियन्त्रिकी, शिक्षा एवं विधि संकाय की परीक्षाओं से सम्बद्ध अध्यादेश (आर्डीनेंस) पृथक पुस्तिकाओं में संकलित हैं; छात्रों को सलाह दी जाती है कि उनकों देखें;

2- समय–समय पर संशोधन या पुननिर्माण कर अधिनियमों/अध्यादेशों/नियामों/ विनियमों पाठ्यक्रमों व पुस्तकों में परिवर्तन कर अधिनियमों/अध्यादेशों/नियामों/ विनियमों पाठ्यक्रमों व पुस्तकों में परिवर्तन किया जा सकता है तथा किसी भी परिवर्तन को, छात्र को मानना होगा जो पाठ्यक्रम के उन वर्गों के लिए लागू हो जिसे परिवर्तन के समय पूरा नहीं किया हो, बशर्ते कि विश्वविद्यालय ने अन्यथा प्रकार से छूट न दे दी हो।

3- प्रत्येक पश्न–पत्रों में दस प्रश्न होंगे। पाँच खण्डों में से प्रत्येक में दो प्रश्न होंगे। छात्रः को पाँच प्रश्नों के उत्तर देना होगा। परन्तु प्रत्येक खण्ड में से एक प्रश्न का उत्तर अनिवार्यतः देना होगा।

4- पाठ्यक्रम हिन्दी एवं अंग्रेजी दोनों भाषाओं में दिया हुआ है। यदि कोई विसंगति प्रतीत होती है तो अंग्रेजी पाठ्यक्रम को ही प्रामाणिक माना जाय।

5- विभिन्न पाठ्यक्रम मंडलों द्वारा स्वीकृत पाठ्यपुस्तकों/संस्तुत पुस्तकों/संदर्भ पुस्तकों की सूची अंग्रेजी पाठ्यक्रम में उपलब्ध है।

नोट : विद्या परिषद् द्वारा लिये गये निर्णय अन्तिम होंगे।

Published by : ADHUNIK VIGYAN PRAKASHAN, BIKANER M. : 9829280717
For M.G.S. University, Bikaner
Print at : Rajasthan Computer & Printers, Bikaner M. : 9352999951

SCHEME OF EXAMINATION

Each theory paper 3 Hrs. duration 100 Marks
Dissertation/Thesis/Survey Report/Field Work. If any 100 Marks

1. The number of paper and the maximum marks for each paper practical shall be shown in the syllabus for the subject concerned. It will be necessary for a candidate to pass in the theory part as well as in the practical part (Whenever Prescribed) of a subject/Paper separately.
2. A candidate for a pass at each of the Pervious and the Final Examination shall be required to obtain (i) atleast 36% marks in the aggregate of all the paper prescribed for the examination and (ii) atleast 36% marks in practical (s) whenever prescribed the examination, provided that if a candidate fails to atleast 25% marks in each individual paper work. Wherever prescribed, he shall be deemed to have failed at the examination not with standing his having obtained the minimum percentage of marks required in the aggregate for the examination. No division will be awarded at the Pervious Examination, Division hsall be awarded at the end of the Final Examination combined marks obtained at the Pervious and the Final Examination taken together, as noted below :
   First Division 60% of the aggregate marks taken together
   Second Division 40% of the Pervious and the final Examination.
   All the rest shall be declared to have passed the examination.
3. If a candidate clears any paper (s) Practical(s)/Dissertation Prescribed at the Pervious and or/final Examination after a continuous period of three years, then for the purpose of working out his division the minimum pass marks only viz 25% (36% in the case of practical) shall be taken into account in respect of such paper(s) Particle(S) Dissertation are cleared after the expiry of the aforesaid period of three year, provided that in case where a candidate require more than 25% marks in order to reach the minimum aggregate as many marks out of those actually secured by him will be taken into account as would enable him to make the deficiency in the requisite minimum aggregate.
4. The Thesis/Dissertation/Survey Report/Field Work shall be typs & written and submitted in triplicate so as to reach the office of the Register atleast 3 weeks before the commencement of the theory examinations. Only such candidates shall be permitted to offer dissertation/Fields work/ Survey Report/Thesis (if provided in the scheme of examination) in lieu of a paper as have secured atleast 55% marks in the aggregate of all scheme and I and II semester examination taken in the case of semester scheme, irrespective of the number of paper in which a candidate actually appeared at the examination.

N.B. (i) Non-Collegiate candidates are not eligible to offer dissertation as per Provision of 170-A.

M. A. (Final) Examination, 2017

Papers	**Nomenclature**	**Duration**	**Max.Marks**
Compulsory Papers			
I	Topology and Functional Analysis	3 Hrs.	100
II	Continuum Mechanics	3 Hrs.	100
	Optional Papers (Any THREE of the following) :		
Opt Paper I	**Generalized Hyper-** geometric Functions	3 Hrs.	100
Opt Paper II	Advance Discrete Maths.	3 Hrs.	100
Opt Paper III	Mechanics	3 Hrs.	100
Opt Paper IV	Fluid Dynamics	3 Hrs.	100
Opt Paper V	Differential Geometry of manifolds	3 Hrs.	100
Opt Paper VI	Operations Research	3 Hrs.	100
Opt Paper VII	Industrial Mathematics	3 Hrs.	100
Opt Paper VIII	Topology	3 Hrs.	100
Opt Paper IX	Mathematical theory of Statistics	3 Hrs.	100
Opt Paper X	Computer Applications (Only for regular students)	3 Hrs.	100
Opt Paper XI	Mathematical Modeling	3 Hrs.	100
Opt Paper XII	Relativity and Transform Calculus)	3 Hrs.	100

Paper - VI (Topology and Functional Analysis)

3 Hrs. duration **100 Marks**

Note : The paper is divided into five independent units. Two

questions will be set from each unit. The candidates are required to answer one question from each unit.

Unit I (Topology)

Topological spaces: Neighbour hood and neighbourhood system, coarser and finer topologies, relative topologies, equivalent definitions of topologies. Continuity and topological equivalence: open and closed functions. Homeomorphic spaces, topological properties, topologies induced by functions.

Unit II(Topology)

Separation axioms: T1 space, Hausdorff spaces, regular spaces, Functions that separate points. Completely regular spaces sequentially compact sets, countably compact sets. Locally compact spaces, compactness in metric spaces.

Unit III (Banach Spaces)

Normed Vector spaces, Banach Spaces and their examples, Continuous linear transformations, The Hahn-Banach theorem and its application, The open mapping theorem , the closed graph theorem ,the uniformboundednesstheorem.

Unit IV (Hilbert Spaces)

Inner product spaces, Hilbert space and their examples, Cauchy Schwarz's inequality, Parallelogram Law, Orthogonal complements, Orthonormal sets.

Unit V (Hilbert Spaces)

Bessel's inequality, Gram Schmidt orthogonlization process. Riesz representation theorem, the adjoint of an operator, self adjoint and normal operators projections, process.

Books Recommended:

1. L.A. Luesternik and L.J. Soboler : Elements of Functional Analysis, Hindustan Publishing Company (1974).
2. A.E. Taylor : Introduction to Functional Analysis (1958), John Wiley and Sons.
3. J.Dieudonne : Foundations of Modern Analysis (1969), Academic Press.
4. Kosaku Yosida : Functional Analysis (1974), Narosa Publishing House, New Delhi.
5. B. Choudhary : Functional Analysis with Application (1989), Wiley Eastern Limited and Sudarshan Nanda
6. Nahar, T.S : Metric Spaces, Navkar Publications, AJMER
7. Nahar, T.S. : Functional Analysis, Navkar Publications, AJMER
8. Sharma, J.N.. : Functional Analysis, Krishana Prakashan Mandir, Meerut
9. S.Lipsechutz : General topology. The any problem, MCgraw

Hill Co. (ch.V,VI,X,Xi)

10. G.F.Summous : Introduction of topology and modern Analysis.

Paper - VII (Continuum Mechanics)

3 Hrs. duration **100 Marks**

Note: The paper is divided into five independent units. Two questions will be set from each unit. The candidates are required to answer one question from each unit.

Unit I

Cartesian Tensors, Index notations and transformation, Laws of Cartesian tensors, Addition, Subtraction and multiplication of Cartesian tensor, Gradient of a scalar function, Divergence of a vector function and curl of a vector function using the Index notation, The identity stokes, Gauss and Green's theorems.

Unit II

The continuum approach classification of continuous media, Body forces and surface forces, Components of stress tensor, Force and moment equation of equilibrium, The stress quardric, Principle stresses and Principle axes, Stress invariants and the stress deviator tensor, Maximum shearing stress.

Unit III

Lagrangian and Eulerian description of deformation of flow, the comoving derivative, Velocity and acceleration, The continuity equation.

Strain tensors, The linear rotation tensor and rotation vector, Analysis of rotation displacement, Geometrical meaning of the components of the linear strain tensor, Principle axis theory for the linear strain tensor, properties of Linear strain tensors, The linear cubical dilatation, Compatibility equations for the linear strain components.

Unit IV

The rate of strain tensors and the vorticity tensor, The rate of rotation vector and the vorticity, Properties of the rate of strain tensor, Rate of cubical dilatation.

Law of conservation of mass and Eulerain Continuity equation, The momentum integral theorem and the equation of motion, Kinetic equation of state, The first and the second law of thermodynamics and the dissipation function.

Unit V

Application: (Linear elasticity): Assumption and basic equations, Generalized Hooke's Law for an isotropic Homogeneous solid, Compatibility equations. Classification of types of problems in linear elasticity, The Principle of superposition, The strain energy function, The uniqueness theorem P.I. Relationship and the work kinetic energy equation,

Irrotational flow and the velocity potential, Kinetic equation of

state and the First Law of Thermodynamics. The equation of continuity, the equations of motion, Vorticity-Strema Surface for inviscid flow, Bernoulli's equations, Irrotational flow and the velocity potential, Similarity parameters and fluid flow.

Books for Reference :

1. D. Frederic and T.S. Chang : Continuum Mechanics, Ally and Bacon. Inc. Boston.
2. Mase. G.E. : Continuum Mechanics (Schaum series)
3. Sommefield A. : Mechanics Deformable bodies.
4. Mortone E. gurtin : An Introduction to Continuum Mechanics, (Academic Press)
5. Sharma, K.D. : Continuum Mechanics, Navkar Publications, AJMER

Optional Papers (ANY THREE of the following)

Opt. PAPER - I (Generalized Hypergeometric Functions)

Duration 3 Hrs. **Max. Marks : 100**

Note: The paper is divided into five independent units. Two questions will be set from each unit. The candidates are required to answer one question from each Unit

UNIT- 1

Generalized Hypergeometric Functions: Definition, Convergence conditions for pFq differential equation and its solution, Watson's, Dixon's, Whipple's and Saalschutz theorems for the series 3F2 with unit argument, Fundamental theorem due to thomae.

UNIT-2

Contour integral representation for pFq, Euler's type integrals involving pFq. Special cases, Product formulas due to Ramanujan, Preece and Bailey.

Meijer's G function: Definition, Nature and convergence conditions for the contours, special cases, Identities.

UNIT-3

Transformation formulas, differentiation formulas, recurrence relations, Contiguous functions, relations. Simple finite and infinite integrals involving G-function, Mellin and Laplace transforms of G-function.

UNIT-4

H-function: Definition, Convergence conditions, Series representations, Special cases, Transformation formulas, Identities, Differentiation formulas, Multiplication formulas.

UNIT-5

Recurrence relations, Contiguous function relations, finite and infinite integrals involving H-functions.

Books Recommended :

1. Bailey, W. N., : Generalised Hypergeometric Series, Cambridge University Press, Cambridge, (1935)
2. Mathai A.M.and : Generalised Hypergeometric functions with applications in
3. R.K.Saxena, Statistics and Physical Sciences, Lecture Notes in Mathematics, 348 Springer verlag, New York, (1973). (Chapters 1 to 4).
4. Mathai A.M.and other : The H-fuction with applications in Statistics.
5. Saxena, R.K disciplines, Wiley Eastern Ltd., New Delhi, (1978) (Chapters 1to3)
6. Raninville E.D. : Special functions, The MacMaillan Co., (1960)
7. Saran, N.,Sharma, S.D. et.al. : Special functions Pragati Prakashan, Meerut. Chapter 4

Opt. Paper II (Advance Discrete Mathematics)

Duration : 3 Hrs. **Max. Marks: 100**

Note : The paper is divided into five independent units. Two questions will be set from each unit. The candidates are required to answer one question from each unit.

Unit I

Formal logic-Structures symbolic representation, propositional logic, equivalence, Contradictions and tautologies, Argument and validity, predicates and quantifiers. Semi groups and monoids-definition and examples of semi group and monoid, congruence relations and semi groups, and sub monoids, direct products, basic homomorphism theorem.

Unit II

Lattices: Lattices as partially ordered sets, their properties, lattices as algebraic system, sub lattices, direct products and homomorphism, some special lattices e.g. complete, complemented and distributive lattices. join-irreducible elements, atoms.

Boolean Algebras: Boolean Algebras as lattices. Various Boolean identities, the switching algebra example, sub algebras, and minterms and maxterms Boolean forms and their quivalence, minimization of Boolean functions, application of Boolean algebra to switching theory (using AND,OR, NOT gates), the Karnaugh map method.

Unit III

Graph theory: definition of undirected graphs, direct graphs, paths, circuits, cycles and sub graphs, induced sub graphs, degree of a vertex, weighted undirected graphs, matrix representations of graphs , connectivity, strong connectivity, complete and complete bipartite graphs, isomorphic graphs, planar graphs and their property, Euler's formula for

connected planar graphs, Eulers theorem on the existence of Eulerian path and circuts, Kuratowski's theorem (Statement only) and its use , cut sets , fundamental cut sets and cyles, Dijksta' algorithm and Warshall's algorithm

Unit IV

Tree , Spanning tree, Minimal spanning trees and Kruskal and Prim algorithms, binary search tree. Tree traversals. Notation of syntax analysis, polish notation, conversions of infix expression to polish notations. The reverse polish notation.

Unit V

Introductory computability theory: finite State machines and their transition table, diagrams. Equivalence of finite state machine. Reduced machine homomorphism. Finite automaton. Acceptors non-deterministic finite automata and equivalence of its power to that of deterministic finite automata. Moore and mealy machines. Turning machine and partial recursive functions.

Grammars and languages: Phrase structure grammars, rewriting rules, derivations and sentential forms. Language generated by a grammar, regular, context free and context sensitive grammar sand languages, regular sets and regular expressions and the pumping lemma, Kleen's theorem.

Books Recommended:

1. J.P. Tremblay and R. Mamohar : Discrete mathematical structures with applications to Computer Science, McGraw Hill Book Co. 1997
2. Seymour, Lepschtz : Finite Mathematics Intonations edition, 1983 McGraw Hill Book Co. New York
3. C.L. Liv : Elements of Discrete Mathematics McGraw Hill Book Co. New York
4. N.Deo : Graph Theory with Application to Engineering Computer Science.Prentice hall of India.

Opt. Paper III (Mechanics)

3 Hrs duration **Max. Marks 100**

Note : The paper is divided into five independent units. Two questions will be set from each unit. The candidates are required to answer one question from each unit.

Unit I

Moment and product of Inertia, parallel axes. Momental Ellip-

soid, D'Alembert's principle. Motion about a fixed axis, General equation of motion of a rigid body, Moment about a fixed axis, The compound pandulum, Centre of percussion.

Unit II

Motion of a rigid body in two dimensions under finite and impulsive forces, Conservation of Momentum and Energy.Lagrange's equations, Initial Motions, Generalized coordinates, Holonimic and Non-holonomic systerms. Scleronomic and Rheonomic systems. Generalized potential

Unit III

Lagrange's equation of first kind, Lagrange's equations of second kind. Hamilton's variables. Hamilton cononical equations cyclic coordinates, Poisson's Bracket. Poisson's identity. Jacobi-Poisson Theorem. Hamilton Jacobi Equations.

Unit IV

(Partial Differantial Equations)

Examples of PDE. Classification. Nonlinear first order PDE, Transport Equation - Initial value Problem. Non-homogeneous Equation.

Unit V

(Partial Differantial Equations)

Laplace's Equation-Fundamental Solution. Mean Value Formulas. Heat Equation -Fundamental Solution, Mean Value Formula, Properties of Solutions. Wave Equation - Fundamental Solution, Solution by spherical means (polar forms), Non-homogeneous wave equations.

Books Recommended :

1. Classical Mechanics	:	Goldstien
2. Engineering Mathematics	:	Erwin Kreyszig
3. Dynamics of Rigid Bodies	:	M. Ray
4. Rigid Body Dynamics	:	Gokhroo et.al.
5. Advanced Differential Equations	:	M.D. Raisinghania

Opt. Paper IV (Fluid Dynamics)

3 Hrs duration **Max. Marks 100**

Note : The paper is divided into five independent units. Two questions will be set from each unit. The candidates are required to answer one question from each unit.

Unit I

Kinematic of ideal fluid, Lagrange's and Euler's method, Equation of continuity in cartesian, Polar and cylinderical co-ordinales, Boundary surfaces, stream lines, Path lines, Velocity potential, Rotational and Irrotational motion, Equation of motion, Bernoulli's theorem, D'Alembert's paradox, Euler's momentum theorem, D'Alember's paradox, Euler's momentum theorem, Helmholtz, Cauchy's integrals, Motion due to impulsive forces.

Unit II

Motion in two dimensions, Stream function, Irrotational motion, Complex potential, Sources, Sinks, Doublets and images, Motion of circular and elliptical cylinder, Motion of a sphere

Unit III

Viscosity, Analysis of stress, Relation between stress and rate of strain, Dynamical similarity and inspection and dimensional analysis, Buckinghemt theorem, Physical importance of non-dimensional parameters, Reynolds number, Fruoude number, Mach number, Prandtl number and Grashoff number, Navier- Stoke's equations, some exact solutions of Navier-stoke's equations, Plane couete flow, Plane posiseulle flow, Generalised plane couetel flow, Hagan-Poiseuille flow, Flow in tubes in uniform cross-section

Unit IV

Flow in convergent and divergent channels, Stagnation point flows, Flow due to a rotating disc, Flow due to a plan wall suddently set in motion (stokes first problem), Flow due to an oscillating plane wall (Stoke's second problem), Starting flow in a pipe

Unit V

Theory of very slow motion, Stoke's flow pas a sphere, Oseen's flow past a sphere, Lubricandtion theory.

Books Recommended :

1. A Text book on Hydrodynamics	:	M.Ray
2. A Treatise on Hydrodynamics	:	Ram Say and Besant
3. Viscous Fluid Dynamics	:	J.L.Bansal
4. Fluid Dynamics	:	Shanti Swaroop

Opt. Paper V (Differential Geometry of manifolds)

3 Hrs duration **Max. Marks 100**

Note : The paper is divided into five independent units. Two questions will be set from each unit. The candidates are required to answer one question from each unit.

Unit I

Definition and examples of differentiable manifolds, Tangent spaces, Jacobian map, one parameter group of transformations, Lie derivative, Immersion and Embedings , distributions, exterior algebra, exterior derivative.

Unit II

Topological groups, lie groups and lie algebras, product of two lie groups, one parameter sub groups, and exponential maps, examples of lie groups, homomorphism and isomorphism, lie transformations groups, general linear groups

Unit III

Principal fibre bundle, linear frame bundle, Associated fibre bundle, Vector bundle, induced bundle, bundle homomorphisms. Riemannian manifolds, Riemannian connection

Unit IV

Curvature tensors, Sectional curvature, Schur's theorem, Geodesics in a Riemannian manifold, projective curvature tensor, conformal curvature tensor.

Unit V

Submanifolds, and hyper surfaces, Normals Gauss' formulae, Weingarten equations, line of curvatures, Generalised Gauss and Mainardi-Codazzi equation, Atmost comple manifolds, Nijenhuis tensor , Contravariant and covariantalmost analytic vector fields, F-connection.

Books Recommended :

1. B. B. Sinha. An introduction to Modern Differential Geometry, Kalyani Publishers, New Delhi, 1982.
2. K. Yano.and M. Kon, Structure of Manifolds World Scientidic Publishing Co.Pvt.Ltd., 1984.
3. R.S. Mishra, A course of tensors with applications to Riemannian Geometry ,Pothishala (pvt) Ltd., 1965.
4. R. S. Mishra, Structures on a differenetiable manifold and their applications, Chandrama Prakashan, Allahabad, 1984.

Opt. Paper VI (Operations Research)

3 Hrs. duration **100 Marks**

Note: The paper is divided into five independent units. Two questions will be set from each unit. The candidates are required to answer one question from each unit.

Unit I

The theory of simplex method, Simplex algorithm, Duality, Degeneracy, Variation of the simplex method

Unit II

Dual Simplex method, Revised simplex method, Sensitivity analysis (Post optimal solution)

Unit III

Integer programming, Bounded variable problem, Convex function, Saddle point.

Unit IV

Conditions for non-linear programming problem, Kuhn Tucker conditions for optimization for non-linear programming problem.

Convex programming with separable convex objectives.

Unit V

Quadratic programming method for quadratic programmes due to Wolfe and Frank, Duality theorem for quadratic programming,

Dynamic programming its notion and formulation.

Books Recommended :

1. Hadley : Linear Programming
2. Gass : Linear Programming
3. Hadley : Non-linear Programming
4. Satty : Mathematical Methods of Operational Research
5. Sadieni, Friendmand and Yaspann : Operations Research
6. Bellmen R. : Dynamic Programming
7. Vajda : Mathematical Programming

Opt. Paper VII (Industrial Mathematics)

3 Hrs. duration **100 Marks**

Note : The paper is divided into five independent units. Two questions will be set from each unit The candidates are required to answer one question from each unit.

Unit I

Difference equations and techniques of solution, Finite differences methods and their applications to problems of Industry with special reference to Fluid Mechanics.

Unit II

Operational Techniques: Linear Programming Problems, Transportation Problems, Assignment problems.

Unit III

Inventories and Replacement Queueing Theory: Flexible manufacturing systems including machine maintenance.

Unit IV

Statistical Quality Control: Meaning of statistical control and its relations with specification limits, Modified control limits warning limits and tolerance limits, Methods of estimation, inherent varibility Rational sub-grouping, Successive estimates, Acceptance sampling by attributes, need for sampling inspection methods for acceptance, Lot quality and lot acceptance.

Unit V (Reliability Theory)

Coherent structure, Reliability of systems of independent components, Bounds on system reliability, Shape of the system reliability function, Notion of aging, Parametric families of life distribute with monotone failure rate.

Books Recommended:

1. Sharma S.D. : Operations Research.

Opt. Paper - VIII (Topology)

3 Hrs. duration **100 Marks**

Note : The paper is divided into five independent units. Two

questions will be set from each unit. The candidates are required to answer one question from each unit.

Unit I

Topological spaces, Subspaces, Open sets, Closed sets, Neighbourhood system,Continous mapping and Homeomorphism bases, and sub basis, Cauchy's sequences

Unit II

Nets, Filters,Complete Metric spaces, Product spaces, Quotient spaces, Compact and locally compact spaces, Tychonoff's One point compactifications. Separation axioms, Normal spaces

Unit III

Connected and locally connected spaces, Continuity and connectedness and compactness, Hausdra spaces,

Unit IV

Regular spaces, Topological groups, Closed subgroups and the topology on the Spaces of right / left cosets

Unit V

Locally compact group and compact groups. Left / Right Haar measures on locally compact groups, existence and uniqueness of left / right Haar measure.

Books Recommended :

1. Topological Spaces.	:	Kowalsky
2. General Topology.	:	Kelly
3. Introduction to Topology	:	G.F. Simmons and Mordern Analysis
4. Introduction to General Topology	:	K.D. Joshi
5. General Topology.	:	Gautam and Santi Naryan

Opt. Paper IX (Mathematical theory of Statistics)

3 Hrs duration **Max. Marks 100**

Note : The paper is divided into five independent units. Two questions will be set from each unit. The candidates are required to answer one question from each unit.

Unit I

Sample spaces, Combination of events, Statistical independence, Conditional probability-Bays theorem Repeated trials, Random Variable, Distribution function, Probability function, Density function, Mathematical expectation, Generating function (mfg and pgf) continuous probability distribution characteristic function, Fourier's Inversion, Cheby-Shev and Kolomogrovea inequality, Weak and Strong laws of largenumbers,

Unit II

Normal, Hyper-geometric, Rectangular, Negative Binominal,

Beta, Gamma and Cauchy's distribution.

Methods of least square and curve fitting, correlation and regression coefficient.

Unit III

Index numbers, Introduction, Price-relatives, Quantity relatives, Value relatives, Link and Chain relatives, Aggregate methods, Fisher's Ideal Index, Change of the base period of the index numbers.

Elementary sampling theory, Distribution of means of samples from Binomial, Cauchy, Rectangular and normal distributions, Distribution of second order moments in samples from normal population, Exact distributions of X2, t, z and F, Statistics in samples from a normal population, Their simple properties and applications.

Unit IV

Test of significance of difference between two means and two standard deviations for large samples with modification for small samples and taken from normal population.

Association of attributes, Analysis of variance, simple cases (one criteria and two criteria of classification), Elementary statistical

Unit V

Theory of Estimation, Fisher's criteria for the best estimator, Consistent, Efficient and sufficient estimator, Method of Maximum Likelihood estimators and other methods of estimation, Method of least squares.

Books Recommended :

1. Kapur and Saxena : Mathematical Theory of Statistics.
2. Weatherburn : A First Course in Mathematical Statistics.
3. M.G. Kendall : The Advanced Theory of Statistics.
4. Uspensky : Introduction of Mathematical Probability.

Opt. Paper X (Computer Applications)

(To be offered by Regular Students only)

3 Hrs duration	Theory Paper	Max. Marks 60
2 Hrs duration	Practical	Max. Marks 40

Note : The paper is divided into five independent units. Two questions will be set from each unit. The candidates are required to answer one question from each unit.

Unit I

Introduction to computers, computer organization, Input-Output devices, memory systems. Hardware and Software. Operating system. Computer languages, system software and application software, algorithems and flow charts.

Unit II

Programming languages and problems solving on computers. Object Oriented System, Difference Between Procedural and Object

Oriented Languages, Object Oriented Paradigm, Inheritance, Polymorphism, Abstraction, Encapsulation, Benefits and Application of Oops. (Programming with C++)

Unit III

Introduction to C++, Character set,Constant,Variables and Data Types,Operator, Arithmetic Expression, Operator Precedence and Associatively, Input, conditional Statements, Conditional Operator, Scope of Variables, Type Conversion.

Unit IV

Iteration: While, do while, for, Break, Continue, Goto Function-standard and User-Defined Function, Recursive function, Passing By Value And Reference, Pointers and Functions, Reference and Functions. Array: One Two And Multidimensional, Passing Array to a Function.

Unit V

Class: Definitions, Declaring Members and Methods in Functions, Functions Returning Objects, Static Data Members and Methods, Inline Function, Offline (Outline), Function Overloading and Overriding. Constructors-Needs and its Usage

Types of Constructors, Destructor, Pointer to Object, Pointers to Members, Dynamic Class Objects, Friend Functions and its Usage, Inheritance-Needs of Inheritance, Usage, Type of Inheritance.

PRACTICAL

Note: 1. Each candidate is required to appear in the Practical examination to be conducted by internal and external examiners. External examiner will be appointed by the University through BOS and internal examiner will be appointed by the Head of the Department / Princi

Simple C++ Programming of problems of numerical analysis, solution of quadratic equations, mean and standard deviation, fitting of curves, correlation coefficient, applications into matrices, sorting of numerical character string data etc.

Distribution of Marks:

Two Practicals - 15 Marks each	=	30 Marks
Practical Record	=	05 Marks
Viva - Voce	=	05 Marks
Total Marks	=	40 Marks

Opt. Paper XI (Mathematical Modelling)

3 Hrs duration **Max. Marks 100**

Note : The paper is divided into five independent units. Two questions will be set from each unit. The candidates are required to answer one question from each unit.

Unit I

The process of Applied mathematics, Setting up first order differential equations, Qualitative solution sketching.

Unit II

Difference and differential equation growth models. Single-species population models, Population growth- An age structure model.

Unit III

The spread of Technological innovation. Higher order linear models - A model for the detection of Diabetes. Combat models Traffic models- Car-following models

Unit IV

Equilibrium speed distributions.Non linear population growth models, Prey-Predator models, Epidemic growth models.

Unit V

Models from Political Science - Proportional representation-cumulating voting, comparison voting. Applications in Ecological and Environmental subject areas- Urban waste water. Management planning.

Books Recommended :

1. Kapur J.N. : Mathematical Modelling
2. Saxena V.P. : Mathematical Models in Biology
3. Mauriya R.P. : Mathematical Modelling, Navkar Publications, Ajmer.

Opt. Paper XII (Relativity and Transform Calculus)

3 Hrs duration **Max. Marks 100**

Note : The paper is divided into five independent units. Two questions will be set from each unit. The candidates are required to answer one question from each unit.

Unit- I

Michelson - Morely experiment. Lorentz-Fitzerald contraction hypothesis.Postulates of special theory of Relativity. Special Lorentz transformation equation,Compostion of parallel velocities, length contraction and time dilation. Transformation equations for components of velocity, acceleration of a particle and lorentz contraction factor. Geometrical representation of space - time four -dimensional. Minkowskian spaces - time of special Relativity, time like, space-like and light-like intervals.null cone,proper time world line of a particle.

Unit-II

Variation of mass with velocity, equiavalence of mass and energy. Relativistic Lagrangian and Hamiltonian. Relativistic equation of motion of particle, Energy-momentum tensor.Principles of equivalence and general covariance, geodesic principle. Newtonian approximation of relativistic equation of motion.Einsten's field equations and its Newtonian approximation.

Unit-III

Schwarzchild external solution and its isotropic form, Birkff's theorem,Planetary orbits, analogues of Kepler's laws in general Relativity, Three crucial test : (Advance of perihelion of planet mercury, bending of light ray in gravitational field. Gravitation red shift of spectral lines). Energy momentum tensor of a perfect fluid.Schwarzschield internal solution . Boundary conditions.

Unit-IV

Fourier Transform : Definition and Elementary Properties of sine, Cosine Complex Transform, Convolution theorem , Inversion Theorems and Fourier transform of derivatives , Application to the solutions of Partial Differential Equations.

Unit-V

Hankel Transform: Definition and Elementary properties ,Hankel Transform of derivatives inversion Theorem and Parseval identity, Application to the solution of simple Boundary value problem.

Mellin Transform : Definition and Properties , Mellin Transform of derivatives , Inversion theorem and Convolution theorem.

Book Recommended for Reference:

1. Sneddon I.N. : The use of Integral Transform McGraw Hill Co.,1966.
2. Gokhroo et.al. : Transform calculus , Navkar Publication, Ajmer
3. Vasishtha et.al. : Integral Transform ,Krishna Prakashan Mandir,Meerut
4. Goyal and Gupta: Theory of Relativity, Krishna Prakashan Mandir, Meerut
5. Satya Prakash : Realtivistic Mechanics , Prakashan, Meerut.
6. Raj Bali : Theory of Relativity , Jaipur publishing House, Jaipur