Swami Ramanand Teerth Marathwada University, Nanded.

M.A. /M. Sc. First Year Syllabus (Mathematics)

(Effective From June-2014)

Aims and Objectives of the new curriculum

- To maintain updated curriculum.
- To take care of fast paced development in the knowledge of mathematics.
- To meet the needs and requirements of the society and to enhance the quality and standards of Mathematics Education.
- To provide a broad common frame work, for exchange, mobility and free dialogue across the Indian Mathematical and associated community.
- To provide multidisciplinary profile and to allow a flexible cafeteria like approach including initiating new papers to cater to frontier developments in the subject like Mathematics.
- To create and aptitude for Mathematics in those students who show a promise for higher studies and creative work in Mathematics.
- To create confidence in others, for equipping themselves with that part of Mathematics which is needed for various branches of Sciences or Humanities in which they have aptitude for higher studies and original work.

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EFFECTIVE FROM JUNE-2014

Swami Ramanand Teerth Marathwada University, Nanded.

M.A./M. Sc. First Year Syllabus (Mathematics)

First Semester		Second Semester	
Paper No.	**Name of the paper**	**Paper No.**	**Name of the paper**
I	Abstract Algebra-I (Group and Ring Theory)	VII	Linear Algebra
II	Real Analysis	VIII	Measure and Integration Theory
III	Ordinary Differential Equations	IX	Partial Differential Equations
IV	Complex Analysis-I	X	Complex Analysis-II
One paper to be chosen from following which are taught in the department.			
V(A)	Discrete Mathematics	XI(A)	Combinatorics
V(B)	Dynamics and Continuum Mechanics-I	XI(A)	Dynamics and Continuum Mechanics-II
V(C)	Theory of Probability	XI(A)	Operation Research
V(D)	Differential Geometry of Manifolds- I	XI(A)	Differential Geometry of Manifolds- II
VI	Tutorial-I-(Compulsory)	XII	Tutorial-II-(Compulsory)

Notes:

1. **Each theory paper having 6 weekly periods.**
2. **Each paper having 50 marks.**
3. **Each Paper having maximum 60 periods.**

Paper-I

Abstract Algebra-I (Group and Ring Theory)

Prerequisites: Semi groups and groups, Subgroups and Cosets. Rings, Examples of rings, Types of rings, Subrings and Characteristic of a ring.

Unit-I:

Cyclic groups, Generators and relations, Normal subgroup and quotient group, Isomorphism theorems, Automorphism, Conjugacy and *G*-sets, Normal series, Solvable groups, Nilpotent groups.

Unit-II:

Group Homomorphism, First Isomorphism Theorem, Fundamental Theorem of Finite Abelian Groups, Permutation Groups, Cyclic decomposition, Alternating group A_n, Structure of groups, Direct product, Finitely Generated Abelian Groups, Invariants of a finite abelian group, Sylow Theorems.

Unit-III:

Ideals and homeomorphisms, Maximal and prime ideals, Principal ideal, Nilpotent and nil ideals, Zorn's lemma, Unique Factorization Domains, Principal Ideal Domains, Euclidean Domains, Polynomials over UFD.

Text Book:

1. **P. B. Bhattacharya, S. K. Jain and S. R. Nagpaul**, "Basic Abstract Algebra", (Second Ed.), Cambridge Univ. Press (Indian Ed.1995).

Reference Books:

1. **Joseph A. Gallian**, "Contemporary Abstract Algebra", (Fourth Ed.), Narosa, 1999.
2. **I. S. Luthar and I. B. S. Passi**, "Algebra-Vol. 1: Groups", Narosa, New Delhi, 1996.
3. **V.K. Khanna, S.K. Bhambri**, "A Course in Abstract Algebra", Vikas Publicing House. (Second Edition)
4. **David Dummit and Richard Foote**, "Abstract Algebra", John Wiley and Sons.

Paper-II

Real Analysis

Unit-I:

The Riemann Stieltjes Integral: Definition and existence of integral, Properties of the integral, Integration and Differentiation.

Unit-II:

Sequence and series of functions: Discussion of main problem, Uniform Convergence, Uniform Convergence and Continuity, Uniform Convergence and integration, Uniform Convergence and Differentiation, Equicontinuous Families of Functions.

Unit-III:

Derivative, Continuously differentiable functions, Chain rule, Inverse Function Theorem, Implicit Function Theorem.

Text books:

1. **Walter Rudin**, "Principals of mathematical analysis", McGraw Hill, International Editions.
2. **J.R. Munkres**, "Analysis on Manifolds",

Reference books:

1. **Robert G. Bartle, Donald R. Sherbert**, "Introduction to Real Analysis", Wiley India Edition
2. **N.L. Carothers**, "Real Analysis", Cambridge University Press.
3. **H.L. Royden**, "Real Analysis', PHI Learning Pvt. Ltd.(Third Edition)

Paper–III

Ordinary Differential Equations

Prerequisites: Linear equations of first order, Initial Value Problem for second order equations, Initial value problems, Solutions of the homogeneous equation.

Unit-I:

Linear Equations with constant coefficients: Linear dependence and independence, A formula for the Wronskian, The non-homogeneous equations of order two, The homogeneous equations of order n, Initial Value Problem for n^{th} order equations, Equations with real constants, The non-homogeneous equations of order-n, A special method for solving the non-homogeneous equation, Algebra of constant coefficient operators.

Unit-II:

Linear equations with variable coefficients: Wronskian and linear independence, Reduction of order, Non-homogeneous equations, Legendre equation, Linear Equations with regular singular points: Euler equation, Second order equation with regular singular points, Exceptional cases, The Bessel equation, The Bessel equation (Continued).

Unit-III:

Existence and uniqueness of solutions to first order equations: Separation of variables, Exact equations, Method of successive approximations, Lipschitz condition, Convergence of the successive approximations, Non local existence of solutions, Approximations to, and uniqueness of solutions, Equations with complex valued functions, Green's function, Sturm-Liouville Boundary Value Problems.

Text Book:

1. **E. A. Coddington**, "An Introduction to Ordinary Differential Equations", (Prentice- Hall).
2. **William F. Trench**, "Elementary Differential Equations with Boundary Value Problems."

Reference Books:

1. **G. F. Simmons and S. G. Krantz, "**Differential Equations", (Tata McGraw-Hill).
2. **Daniel A. Murray, "**Introductory Course in Differential Equation"**,** Universities Press.

P–IV

Complex Analysis–I

Prerequisites: Complex Number, Complex Field, Modulus, Argument and Conjugate of complex numbers, Algebra of complex numbers, Rectangular and Polar representation of Complex numbers, Point sets in the plane, Sequences.

Unit-I:

Stereographic Projection, Basic Mappings, Linear Fractional Transformation, Other Mappings, The Exponential Function, Mapping Properties, The Logarithmic Function, Complex Exponents.

Unit-II:

Cauchy–Riemann Equation, Analyticity, Harmonic Functions, Sequences of Functions, Uniform Convergence, Maclaurin and Taylor Series, Operations on Power series.

Unit-III:

Curves, Parameterizations, Line Integrals, Cauchy's Theorem.

Text Book:

1. **S. Ponnusamy and Herb Silverman**, "Complex Variables with Applications", Birkhauser Publication.

Reference Books:

1. **Silverman Herb**, "Complex Analysis",
2. **John B. Convey**, "Function of one complex variable", Narosa Pub. House, 1980.
3. **Lars V. Ahlofors**, "Complex Analysis", McGraw Hill Co.
4. **S. Ponnusamy**, " Foundations of Complex Analysis", Narosa Publishing House.

P-V(A)

Discrete Mathematics

Unit-I: Lattices and Algebraic systems, Principle of duality, Basic properties of algebraic systems defined by lattices, Distributive and Complemented lattices, Boolean lattices and Boolean algebras, Uniqueness of finite Boolean algebras, Boolean functions and Boolean expressions, Propositional Calculus, Design and implementation of Digital Networks, Switching Circuits.

Unit-II: Definition and types of graphs, Applications of graphs, Finite and infinite graphs, Incidence and degree, Isolated vertex, Pendant vertex, Null graph, Brief history of graph theory, Isomorphism, Subgraphs, Walks, Paths and Circuits, Connected and Disconnected graphs, Euler graphs, More on Euler graphs, Operations on graphs, Hamiltonian paths and circuits, The travelling salesman problem, Trees, Properties of trees, Pendant vertices in a tree, Distance and centre in a tree, Rooted and binary tree, On counting trees, Spanning trees, Fundamental circuits, Finding all spanning trees of a graph, Spanning trees in a weighted graph, Planar graph, Kurtatowski's two graphs, Different representations of a planar graph, Detection of planarity, Geometrical planarity, Thickness and crossings.

Unit-III: Matrix representation of graphs, Incidence matrix, Sub matrices of A(G), Circuit matrix, Fundamental circuit matrix and its rank, An application to a switching network, Adjacency matrix, Directed graphs, Types, Digraphs and binary relations, Directed paths and Connectedness, Euler digraphs, Trees with directed edges, Fundamental circuits in digraphs.

Text books: 1. C L Liu, "Elements of Discrete Mathematics", Tata McGraw-Hill, Publishing Company (Second Edition).

2. Narsingh Deo, "Graph theory with applications to engineering and computer science", Prentice –Hall of India Pvt. Ltd.

Reference books:

1. **J.P. Tremblay, R. Manohar**, "Discrete mathematical structures with applications to computer science", Tata-McGraw Hill Education Pvt.Ltd.
2. **Kenneth N Rosen**, "Discrete Mathematics and its applications with combinatorics and graph theory", Tata-McGraw Hill Education Pvt.Ltd.
3. **Sanjeev Kumar, Sanjay Chaudhary**, "Applied Discrete Mathematics Theory and applications", Ram Prasad and Sons (India) Educational Publishers.

Paper-V (B)

Dynamics and Continuum Mechanics-I

Unit I:

Vector moment about a point and scalar moment about an axis, Vector and scalar couples, Centroids, Vector calculus, Velocity and acceleration of a Particle along a curve, Motion in plane – radial and transverse components, Relative velocity and acceleration, Vector angular velocity, General motion of rigid body, Moving axes.

Unit-II:

Mass, Momentum, Force, Newton's laws of motion, Work, Energy and Power, Conservative forces, Potential energy, Impulsive forces, Linear momentum of system of particles, Angular momentum, Rate of change of angular momentum, Use of centroids, Moving origin, Impulsive force.

Unit-III:

Moments and products of Inertia, The theorem of parallel and perpendicular axes, Angular Momentum, Principal axes, Kinetic Energy of a rigid body, Momental Ellipsoid, Coplanar distribution, General motion of a rigid body, Problems illustrating the laws of motion, Problems illustrating the law of conservation of energy, Problems illustrating impulsive motion.

Text Book:

i) **F. Chorlton**, "A text book of Dynamics", (E.L.B.S.)(2^{nd} Edition).

Reference Books:

i) **J.L. Synge and Griffith**, "Classical Mechanics",

ii) **Atkin R.H**., "Classical Dynamics",

P-V(C)

Theory of Probability

Unit-I:

Basic Definitions, Mathematical and statistical probability, Subjective Probability, Axiomatic approach to probability, Theorems on probability, Conditional probability, Multiplication theorem of probability of independent events, Examples, Extended axiom of axiom of addition and axiom of continuity, Baye's theorem.

Unit-II:

Random variables, Types , Probability function of discrete random variable, Continuous random variable, Probability density function, Mathematical expectation, Properties of expectation, Variance, Properties of Variance, Moment generating function, Properties of Moment generating function, Cumulants and its properties.

Unit-III:

Discrete Probability distributions, Binomial distribution, Mean and Variance of binomial distribution, MGF and CGF of Binomial distribution, Fitting of binomial distribution, Poisson distribution, Mean and variance of Poisson distribution, MGF and CGF of Poisson distribution, Fitting of Poisson distribution, Normal distribution, Properties of normal distribution, Moments of normal distribution, MGF and CGF and fitting of normal distribution.

Text Book:

1. **S .C. Gupta, V. K. Kapoor**, "Fundamentals of Mathematical Statistics", S. Chand and Sons, New Delhi.

Reference Books:

1. **S.C. Gupta, V.K. Kapur**, "Fundamental of Mathematical Statistics", S. Chand and Co. Ltd.
2. **S. C. Saxena**, "Mathematical Statistics", S. Chand and Co. Ltd.

Paper-V (D)

Differential Geometry of Manifolds-I

Unit-I:

Definition and examples of Differentiable Manifolds, Tangent spaces, Jocobian map, One parameter group of transformations, Lie–derivatives, Immersions and imbedding, Distributions, Exterior algebra, Exterior Derivative.

Unit-II:

Topological groups, Lie groups and Lie algebras, Product of two Lie-groups, One parameter subgroups and exponential map, Examples of Lie-groups.

Unit-III:

Homomorphism and Isomorphism, Lie transformation groups, General linear groups.

Reference Books:

1. **R. S. Mishra**, "A course in tensors with applications to Riemannian Geometry", Potishala (Pvt) Ltd. 1965.
2. **R. S. Mishra**, "Structures on a differentiable manifold and their applications", Chandrama Prakashan, Allahabad, 1984.
3. **B. B. Sinha**, "An Introduction to Modern Differential Geometry", Kalyani Publishers, New Delhi, 1982.
4. **K. Yono and M. Kon**, "Structure of Manifolds", World Scientific Publishing, Co. Pvt. Ltd. 1984.

Paper-VI

Tutorial –I

Papers	Marks
Tutorial on theory paper -I	10
Tutorial on theory paper-II	10
Tutorial on theory paper-III	10
Tutorial on theory paper-IV	10
Tutorial on theory paper – V(A/B/C/D)	10
Total	**50**

The format for scheme of marking for tutorial of 10 marks in each paper is as follows:

Tutorial : ----- Paper No. and name : -----

Name of the teacher :-----

Sr.No.	Name of the student	Seat No.	Submission	Attendance	Content	Viva	Total
			2 Marks	3 Marks	3 Marks	2 Marks	10 Marks

Signature of Teacher

The format, in which, the marks obtained by students in tutorial of 50 marks, to be submitted by HOD through the Principal, to the department of examination S.R.T.M.U. Nanded is as follows:

Sr. No.	Name of the student	Seat No.	Tutorial					Total
			Paper No.----	Paper No.----	Paper No.----	Paper No.----	Paper No.----	
			Marks out of 10	Marks out of 10	Marks out of 10	Marks out of 10	Marks out of 10	Marks out of 50

Head of the Department Teacher

Paper-VII

Linear Algebra

Unit-I:

Introduction, Vector spaces, subspaces, Quotient Spaces, Linear combinations and system of linear equations, linear dependence and independence, Bases and dimension, Maximal Linear Independent Subsets. Linear Transformations, Null spaces, Ranges, The matrix representation of a linear transformation, Composition of linear transformations, Invertibility and Isomorphism, The change of Co-ordinate matrix, Dual spaces.

Unit-II:

Elementary Matrix Operations and elementary matrices, The rank of a matrix, System of linear equations-Theoretical Aspects, System of linear equations-Computational Aspects, Eigen values and Eigen vectors, Diagonalizability, Triangulable Operators, Invariant Subspaces, Cayley-Hamilton Theorem.

Unit-III:

Inner products and Norms, The Gram-Schmidt Orthogonalization process and orthogonal complements, the adjoint of a linear operator, Bilinear forms, Quadratic forms. Jordan Canonical form-I, Jordan Canonical form-II, The Minimal Polynomial, Rational Canonical form.

Text Book:

1. **S.H. Friedberg, A.J. Insel, L.E. Spence**, "Linear Algebra", Prentice-Hall, International, Inc., 3rd Edition.

Reference Books:

1. **Vivek Sahai and Vikas Bist**, "Linear Algebra", Narosa Publishing House, 2nd Edition.
2. **S.Lang**, "Introduction to Linear algebra", Springer International Edition, 2nd Edition.
3. **K.Hoffman, R.Kunze**, "Linear Algebra", Prentice Hall of India.
4. **S.Kumaresan**, "Geometrical approach to Linear Algebra",

Paper-VIII

Measure and Integration Theory

Unit-I:

Lebesgue outer measure, Measurable sets, Measurable functions, Borel and Lebesgue measurability, Integration of non-negative functions, The general integral, Integration of series, Riemann and Lebesgue Integrals, The four derivatives, Continuous non-differentiable functions, Functions of bounded variations, Differentiation and integration.

Unit-II:

Abstract measure spaces: Measure and outer measure, Extension of measure, Uniqueness of the extension, Completion of measure, Measure spaces, Integration with respect to measure.

Unit-III:

Signed measure and their derivatives: Signed measure and the Hahn-Decomposition, the Jordan decomposition, the Raydon–Nikodym theorem (Statement only).

Text book:

1. **G.de Barra**, "Measure theory and integration", New Age International (P) Ltd. Publishers.

Reference Books:

1. **P.K. Jain and V.P. Gupta**, "Lebesgue measure and Integration" New Age International (P) Ltd. Publishers.
2. **P.R. Halmos**, "Measure theory", Van Mostranel Princeton, 1950.
3. **Inder K. Rana**, "An introduction to measure and Integration", Narosa Publishing House, Delhi,1997.

Paper–IX

Partial Differential Equations

Unit-I:

Introduction, Linear Equation of first order, Charpit's Method, Jacobi's Method, Quasi-Linear Equations, Non-Linear First Order P.D.E, General solution of higher order PDE's with constant coefficients, Special Functions - Bessel's function, Legendre's function.

Unit-II:

Introduction, Method of separation of variables, Classification of Second order PDE, One Dimensional Wave Equation, Laplace Equation, Boundary Value Problems, the Cauchy's Problem,

Unit-III:

Dirichlet and Neumann Problem for different regions, Harnack's Theorem, Heat Conduction Problem, Duhamel's Principle, Classification of P.D.E. in the case of *n*-variables, Families of Equipotential Surfaces, Kelvin's Inversion Theorem.

Text Books:

1. **T. Amarnath,** "An Elementary Course in Partial Differential Equations", (2^{nd} edition), (Narosa Publishing House) [Chapters 1 & 2].
2. **I.N. Sneddon**, "Elements of partial differential equations", (Mc-Graw Hill Book Company).

Reference Books:

1. **K. Sankara Rao,** "Introduction to partial differential equation", 3^{rd} edition.
2. **W. E. Williams,** "Partial Differential equations", (Clarendon press-oxford)
3. **E. T. Copson,** "Partial differential equations", (Cambridge university press).
4. **H.K. Dass**, "Advanced Engineering Mathematics", S. Chand & Co. Ltd.

Paper–X

Complex Analysis–II

Unit-I:

Cauchy's Integral Formulae, Cauchy's Inequality and Applications, Maximum Modulus Theorem. Laurent Series, Classification of Singularities, Evaluation of Real Integrals, Argument Principle

Unit-II:

Comparison with Analytic functions, Conformal Mapping, Riemann Mapping Theorem.

Unit-III:

Infinite Products, Weierstras's Product Theorem, Special Functions.

Text Book

1 **S. Ponnusamy and Herb Silverman,** "Complex Variables with Applications", Birkhauser Publication.

Reference Books:

1. **Silverman Herb**, "Complex Analysis",
2. **John B.Convey,** "Function of one complex variable", Narosa Pub. House, 1980.
3. **Lars V. Ahlofors,** "Complex Analysis", McGraw Hill Co.
4. **S. Ponnusamy,** " Foundations of Complex Analysis", Narosa Publishing House.

P-XI (A)

Combinatorics

Unit-I:

Basic counting principles, Simple arrangements and selections, Arrangements and selection with repetition, Distributions, Binomial, Permutations and Combinations.

Unit-II:

Generating function models, Calculation of generating functions, Partitions, Exponential generating functions, A summation method, Recurrence relation model, Divide and conquer relations, Solution of inhomogeneous recurrence relation, Solution with generating functions.

Unit-III:

Counting with Venn diagrams Inclusion formulae, Restricted positions and Rook polynomials, Pigeonhole Principle.

Text Book:

1. **Alan Tucker**, "Applied Combinatorics", (3rd edition), John Wiley & sons, New York (1995)

Reference Books:

1. **V. Krishnamurthy**, "Combinatorial, Theory and Applications", East West Press, New Delhi (1989) Scientific, (1996).
2. **V.K. Balakrishnan**, "Theory and Problems of Combinatories ", Schaum outline series, Mcgraw Hill, New York.

Paper-XI (B)

Dynamics and Continuum Mechanics-II

Unit-I:

Indicial Notation, Summation convention, Dumy indices, Free indices, Kronecker delta, Permutation symbol, Tensor as a linear transformation, Components, Sum, Dyadic product, Product of tensors, Identity, Transpose, Orthogonal tensors, Symmetric and antisymmetric tensors, Eigen values and Eigenvectors of a tensor, The dual vector of an antisymmetric tensor, Principal values and principal directions of real symmetric tensors, Scalar invariants of tensor, Scalar and vector fields, Gradient, Divergence and Curl of these fields.

Unit-II:

Description of motion of a continumm, Material and spatial description, Material derivatives, Deformation, Principle strain, Dilatation, Rate of deformation, Equation of conservation of mass, Compatibility conditions of infinitesimal strain components.

Unit-III:

Stress vector, Stress tensor, Components of symmetry of stress tensor, Principle of moment of momentum, Principal stresses, Maximum shearing stress, Equations of motion, Principle of linear momentum, Fluids, Compressible and incompressible fluid, Equations of hydrostatics, Newtonian Fluid, Interpretation of Incompressible Newtonian fluid.

Text Book:

1. **Lai W. M. Rubin D and Kremple E**, ‘‘Introduction to continuum Mechanics’’,

Reference Book :

1. **Lang R.R.**, “Mechanics of Solids and fluids”, Prentice hall.

Paper-XI(C)

Operation Research

Unit-I:

Definitions, Graphical method, Simplex Method, Duel Simplex Method, Big-M method, Two Phase method.

Unit-II:

Introduction to the model, Definition of the Transportation Model, Matrix Terminology, Formulation and solution of transportation models, Variance in transportation problems, Least time transportation Problems, Post Optimality analysis in Transportation, Trans-Shipment Problems.

Unit-III:

Definition of Assignment Model, Mathematical representation of the assignment model, Comparison with the Transportation model, Solution of the assignment problem, Hungerian method for solution of the assignment problems, Formulation and solution of A.M., Variations of the A.P., Sensitivity analysis in A.P., Travelling Salesman problem. Two by Two and three by three Game Theory, Optimization.

Text Book:

1 **Kanti Swarup**, "Operation Research", S. Chand Co.

Reference Books:

1. **H.A. Taha**, "Operation Research", Prentice Hall.
2. **Premkumar. Gupta**, **D. S. Hira**, "Operation Research", S. Chand and Co. Ltd.

Paper-XI (D)

Differential Geometry of Manifolds-II

Unit-I:

Principal fibre bundle, Linear frame bundle, Associated fibre bundle, Vector bundle, Tangent bundle, Induced bundle, Bundle Homomorphisms.

Unit-II:

Riemannian manifolds, Riemannian connection, Curvature tensors, Sectional Curvature, Schur's theorem, Geodesics in a Riemannian manifold, Projective curvature tensor, Con-formal curvature tensor.

Unit-III:

Submanifolds and Hypersurfaces, Gauss formulae, Weingarten equations, Lines of Curvature, Generalized Gauss and Mainardi Codazzi equations, Almost complex manifolds, Nijenhuis tensor, Contravariant and covariant Almost Analytic vector field, F-connection.

Reference Books:

1. **R. S. Mishra**, "A course in tensors with applications to Riemannian Geometry", Potishala (Pvt) Ltd. 1965.
2. **R. S. Misiira**, **"**Structures on a differentiate manifold and their applications", Chandrama Prakashan, Allahabad, 1984.
3. **B. B. Sinha**, **"**An Introduction to Modern Differential Geometry", Kalyani Publishers, New Delhi, 1982.
4. **B. B. Sinha**, "Structure of Manifolds", World Scientific Publishing Co. Pvt. Ltd. 1984.

Paper-XII

Tutorial –II

Papers	Marks
Tutorial on theory paper -VII	10
Tutorial on theory paper-VIII	10
Tutorial on theory paper-IX	10
Tutorial on theory paper-X	10
Tutorial on theory paper -XI(A/B/C/D)	10
Total	**50**

The format for scheme of marking for tutorial of 10 marks in each paper is as follows:

Tutorial : ----- Paper No. and Name : -----

Name of the teacher :-----

Sr.No.	Name of the student	Seat No.	Submission 2 Marks	Attendance 3 Marks	Content 3 Marks	Viva 2 Marks	Total 10 Marks

Signature

The format, in which, the marks obtained by students in tutorial of 50 marks, to be submitted by HOD through the Principal, to the department of examination S.R.T.M.U. Nanded is as follows:

Sr. No.	Name of the student	Seat No.	Tutorial					Total
			Paper No.----	Paper No.----	Paper No.----	Paper No.----	Paper No.----	
			Marks out of 10	Marks out of 10	Marks out of 10	Marks out of 10	Marks out of 10	Marks out of 50

Head of the Department

FCULTY OF ARTS/SCIENCE

M.A./M.Sc. (First Year)(……Semester) EXAMINATION

MATHEMATICS

QUESTION PAPER PATTERN

NAME OF PAPER

Time: Three Hours Maximum Marks: 50

N.B.: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q. 1) Attempt any one of the following (8 Marks each)
a)
b)

Q. 2) Attempt any one of the following (8 Marks each)
a)
b)

Q. 3) Attempt any two of the following (6 Marks each)
a)
b)
c)

Q. 4) Attempt any two of the following (6 Marks each)
a)
b)
c)

Q. 5) Attempt any two of the following (5 Marks each)
a)
b)
c)