Devi Ahilya University, Indore

Scheme of Examination

Class M.A./M.Sc. (Semester – II)

Subject : Mathematics

Paper	Title of the Paper	Max. Marks		Minimum Passing Marks	
		Theory	C.C.E.	Theory	C.C.E.
I	Advanced Abstract Algebra –II	85	15	28	05
II	Lebesgue Measure & Integration	85	15	28	05
III	Topology – II	85	15	28	05
IV	Complex Analysis –II	85	15	28	05
V	(Any one of the following) 1. Differential Equations –II	85	15	28	05
	2. Advanced Discrete Mathematics –II	85	15	28	05
	3. Programming in C-II (Theory and Practical)	Theory-50 Practical - 35	15	Theory- 17 Practical – 12	05

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07/02/18 07.02.18 7-2-2018

07.02.18. 7/2/18

Department of Higher Education Govt. of M.P.
Semester wise syllabus for P.G.
As recommended by Central Board of Studies and
Approved by HH the Governor of M.P.

(Partially revised by the Board of Studies in Mathematics, DAVV, Indore on 11-05-2015 and to be effective from academic session 2015-2016.)

Class	**: M.Sc./M.A. (Mathematics)**
Semester	**: II**
Title of subject/Group	**: ADVANCED ABSTRACT ALGEBRA-II**
Paper No.	**: I**
Compulsory / Optional	**: Compulsory**

UNIT – I

Introduction to Modules.Examples, Submodules and direct sums, Cyclic module, R-homomorphisms and Quotient modules, Isomorphism.

(1.Chapter 14 Sections 1-3)

UNIT-II

Completely reducible modules Schur's lemma, Free modules, Representation of linear mappings, Rank of linear mapping.

(1.Chapter 14 Sections 4 - 7)

UNIT-III

Noetherian & Artinian modules and rings, Hilbert basis theorem.Weddeburn-Artin theorem.

(1. Chapter 19 Sections 1-3)

UNIT-IV

Uniform modules, Primary modules, Finitely generated modules over a PID, Decomposition theorem, Uniqueness of the decomposition. Application to finitely generated abelian groups.

(1. Chapter 19 Section 4, Chapter 21 Sections 1-3)

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UNIT-V

Linear Transformation ,The Algebra of Linear Transformation, Characteristic Roots, Canonical forms (Triangular form, Nilpotent Transformations, Generalized Jordan form over any field, Rational canonical form).

(1. Chapter 21 Sections 4,5) (2. Chapter 6 Sections 6.1,6.2,6.5,6.6,6.7)

NOTE: Exercise based on theory are expected to be solved.

TEXT BOOK:

1.P.B.Bhattacharya, S.K.Jain and S.R. Nagpaul, Basic Abstract Algebra, Cambridge University Press.
2 I.N.Herstein,Topics in Algebra,Wiley Eastern,New Delhi

REFERENCE:

3.V.Sahai & V.Bisht,Algebra,Narosa Publishing House

4.N. Jacobson, Basic Algebra I and II, 2nd Ed., W. H. Freeman, 1985 and 1989

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Class	**: M.Sc/ M.A. (Mathematics)**
Semester	**: II**
Title of subject/Group	**: Lebesgue Measure & Integration**
Paper No.	**: II**
Compulsory / Optional	**: Compulsory**

Unit-I

F_σ, G_δ sets, Introduction to Lebesgue Outer Measure, Measurable sets and Lebesgue Measure, Non-Measurable sets.

(1. Chapter 2 sections 7, Chapter 3 sections 1- 4)

Unit-II

Measurable Functions, Egoroff'theorem, Lusin's theorem, Little-wood's Three Principles , A non-Borel Measurable Set. The Riemann Integral, The Lebesgue Integral of a Bounded Function over a set of Finite Measure.

(1.Chapter 3 sections 4 – 6, Chapter 4 sections 1,2)

Unit-III

The Integral of a Non-Negative Function , The General Lebesgue Integral, Convergence in Measure, Differentiation of Monotone Functions, The Four Derivatives.

(1.Chapter 4 sections 3 - 5 , Chapter 5 section 1)

Unit-IV

Functions of Bounded Variation, Differentiation of an Integral, Absolute Continuity, Convex Functions, Jensen Inequality. The L^p-spaces, The Holder and Minkowski Inequalities.

(1.Chapter 5 sections 2 - 5, Chapter 6 sections 1,2)

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Unit-V

Convergence and Completeness , Riesz-Fischer Theorem, Approximation in L^p , Bounded Linear Functionals on the L^p-spaces , Riesz Representation Theorem.

(1.Chapter 6 sections 3 - 5)

NOTE: Exercise based on theory are expected to be solved.

Text Book

1. H.L. Royden, Real Analysis Third Edition, PHI

References

2.Walter Rudin, Principles of Mathematical Analysis, McGraw-Hill, International Student Edition

3.G. De Barra. Measure Theory and Integration, Wiley Eastern (Indian Edition).

4. Inder K Rana, An Introduction to Measure and Integration, Second Edition, Narosa Publication.

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Class	**: M.Sc/ M.A. (Mathematics)**
Semester	**: II**
Title of subject/Group	**: Topology -II**
Paper No.	**: III**
Compulsory / Optional	**: Compulsory**

Unit- I

Compactness, Continuous functions and compact sets, Basic properties of compactness.Compactness and F.I.P. (Finite intersection property).Sequential and countably compact spaces. Local compactness and one point compactification. Compactness in metric space. Equivalence of compactness. Countable compactness.

(1.Sections 26, 27, 28 and 29)

Unit- II

The Separation axioms.Regular and Normal spaces.Urysohn's Lemma. Tietze's Extension Theorem

(1.Sections 31, 32, 33 and 35)

Unit-III

Tychnoff product topology in terms of standard sub-base and its characterizations, Embedding and metrization. Embedding lemma and Tychnoff embedding. The Urysohn's metrization.

(1.Section 37) and (2.chapter 9)

Unit –IV

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.Ultra-filters and compactness.

(2.Chapter 10 Sections 1 to 4)

Unit-V

The Fundamental group and covering spaces- Homotopy of paths. The Fundamental group .Covering spaces. The Fundamental group of the circle and the fundamental theorem of algebra.

(1.Sections 51 , 52, 53, 54 and 56)

NOTE: Exercise based on theory are expected to be solved.

Text book

1. James R. Munkres: Topology, A First Course, Prentice Hall of India Pvt. Ltd. New Delhi.

2. K.D.Joshi : Introduction to general Topology, Wiley Eastern Limited.

Reference

3.G.F.Simmons: Introduction to Topology and Modern Analysis. McGraw Hill.

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Class	**: M.Sc/ M.A. (Mathematics)**
Semester	**: II**
Title of subject/Group	**: Complex Analysis – II**
Paper No.	**: IV**
Compulsory / Optional	**: Compulsory**

Unit – I

Isolated Singularities, Problems based on Singularities, Meromorphic functions, Poles and zeros, N - P theorem, The argument principle, Rouche's theorem, Problem based on Rouche's theorem.

(2.Chapter 4)

Unit – II

Residues, Computation of Residue at a finite pole, Cauchy's Residue theorem, Problems based on Residue, Integration Round the circle, Evaluation of the integral $\int_0^{2\pi} f(cos\theta, Sin\theta)d\theta$

(2.Chapter 5 page (81-98)

Unit – III

Jordan's inequality, Jordan's lemma,Evaluation of improper real integrals of the type $\int_{-\infty}^{\infty} f(z)dz$, Evaluation of integrals $\int_{-\infty}^{\infty} f(z)dz$ when poles of f (z) lie on real axis,Integrals of the type $\int_0^{\infty} x^{\alpha-1} f(x)dx$, $\int_0^{\infty} \frac{log x dx}{g(x)}$ Evaluation of integrals involving Quadrant, Sector and Rectangular contours.

(2.Chapter 5 page (99-121)

Unit – IV

Gamma function, Infinite product, Properties of gamma functions, Legendre's duplication formula, Riemann Zeta function, Riemann functional equation, relation between gamma and Zeta functions, weierstrass factorization theorem.

(2.Chapter 9)

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Unit – V

Analytic Continuation, Uniqueness of direct analytic Continuation, Uniqueness of analytic Continuation along a curve, Schwartz reflection principle, Harmonic function, Mean value theorem, Poisson kernel, Problem based on analytic Continuation.

(2.Chapter 11 page (211-217) Article 3.1, Chapter 13 page 252 – 259)

NOTE: Exercise based on theory are expected to be solved.

Text Book:

1.J.B. Convey, Functions of one complex variable, Springer – verlag

2.Complex Analysis – Dr. Brijendra singh,Dr. Varsha Karanjgokar, Dr. R.S. Chandel Golden Valley Publications Agra.

References:

3. S. Ponnuswamy, Foundations of complex analysis, Narosa Publishing House.
4. L.V. Ahlfors,Complex analysis, McGraw Hill

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Semester Wise Syllabus For Post Graduates

As recommended by Central Board of Studies and

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Class -	M.Sc./M.A.
Subject -	Mathematics
Paper -	V (Optional (II)
Paper Title -	Differential Equations-II
Semester -	II

Max.Marks. 100
Theory 85
C.C.E. 15

Unit - I

Dependence on initial conditions and parameters, Prliminaries, conyinuity, differentiability,Higer order differentiability.

Unit II

Poincare-Bendixson Theory-Autonomous systems. Umlanfsatz. Index of a stationary point.

Poincare-Bendixson theorem Stability of periodic solutions, rotation points, foci, nodes and saddle points.

Unit III

Linear second order equations—Preliminaries ,s. Basic facts. Theorems of Sturm. Sturm Liouville Boundary Value Problems. Number ot zeroes,.. Nonoscillatory equations and principal solutions. Nonoscillation theorems,

Unit IV

Use of Implicit function and fixed point iheorems-Periodic solutions. Linear equations. Nonlinear problems.

Unit V

Second order Boundary value problems, Linear problems, Nonlinear problems, Aprori bounds.

Recommended Text

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1.R Hartman, Ordinary Differential Equations, John Wiley (1964).

References

1. W.T. Reid, Ordinary Differential Liquations, John Wiley a Sons, NY (1971).

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Class	**: M.Sc/ M.A. (Mathematics)**
Semester	**: II**
Title of subject/Group	**: Advanced Discrete Mathematic-II**
Paper No.	**: V**
Compulsory / Optional	**: Optional**

UNIT-I

Graph theory :Definition of undirected & directed graph ,Simple graph, Multi graph, Isomorphic graph, Path, Reachability and Connectedness , Simple path ,Simple cycle , Unilaterally connected ,Strongly connected.

(1. Chapter 5 Section 5.1 (5-1.1 & 5-1.2))

UNIT-II

Matrix Representation of Graphs, adjacency matrix, Reachability matrix, Warshal's algorithm,Trees, Directed tree, Terminal node .

(1. Chapter 5 Section 5.1 (5-1.3 & 5-1.4))

UNIT-III

Grammars and Languages: Phrase –Structure Grammars. Rewriting rules. Derivations, Sentential Forms, Language generated by a Grammar. Regular, Context-free, and Context-sensitive Grammars and Languages, Notion of Syntax Analysis, Polish Notation ,Conversion of Infix Expressions to Notations.

(1. Chapter 3 Section 3.3)

UNIT-IV

Finite State Machine: Introductory Sequential Circuits, Equivalence of Finite State Machines, Finite-state machines and their transition table diagram .Reduced Machines, Homomorphism.

(1. Chapter 4, Section 4.6)

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UNIT-V

Introductory Computability Theory: Finite-state Acceptors and Regular Grammars, Nondeterministic finite automation, Turing Machines and Partial Recursive Functions

(1. Chapter 6, Sections 6.1 ,6.2)

Note : Exercise based on theory are expected to be solved.

Text Book

1.J.P .Trembly and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, McGraw-Hill book Co.,1997 .

References

2.C.L.Liu, Elements of Discrete Mathematics,McGraw-Hill Book Co.

3.N.Deo,Graph Theory with Application to Engineering and Computer Sciences, Prentice Hall of India.

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Class	**: M.Sc/ M.A. (Mathematics)**
Semester	**: II**
Title of subject/Group	**: Programming in C-II**
Paper No.	**: V**
Compulsory / Optional	**: Optional**

Unit I

Functions: Basics and Anatomy of function : definition, declaration & prototypes, calling, use and features of function. Passing values b\w function. External Variables, scope rule, call by value, call by reference (only concept), Static Variables, Register Variables, Block Structure. Recursion: need of recursion, types of recursion.

(1. Chapter 1 sections 1.7,1.8 Chapter 4 sections 4.1 – 4.4,4.6—4.8, 4.10)

Unit II

Arrays and multidimensional Arrays: array concept and initialization, memory map of 1D and 2D array, Multidimensional array, storage classes – automatic, extern, static, register, global variable, Command line arguments.

(1. Chapter 1 section 1.6 , Chapter 5 sections 5.7,5.10 Appendix A4.1,A8.1)

Unit III

Array of characters, string constant and variable, Character Input/output statements, array of strings, string handling functions, standard library string function strlen(), strcpy(), strcat(), strcmp() etc, Mathematical functions <math.h>.

(1. Chapter 1 sections 1.9,1.5, Appendix B3, B4)

Unit IV

Pointer: Definition & declaration, Address, pointers and function arguments, pointer & arrays, Address arithmetic, character pointers and functions, pointer arrays, Initialization of pointer arrays, Pointer to function, use of pointer, malloc(), calloc() library function.
(1. Chapter 5 sections 5.1-5.6)

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Unit V

Structures : Basics of Structures, Structure and Functions, Array of Structure, Pointer to Structure, Self referential structure, Unions.

(1. Chapter 6 sections 6.1-6.5, 6.8)

NOTE: Algorithms and Programs based on theory are expected to be developed.

Text Book :

1.Brain W Kernigham & Dennis M Ritchie the C Programmed Language 2nd Edition (ANSI features), Prentice Hall 1989.

Reference Book

2.Samuel P. Harkison and Gly L Steele Jr. C; A Reference manual , 2an Edition Prentice hall 1984.

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