PERIYAR UNIVERSITY

PERIYAR PALKALAI NAGAR

SALEM - 11

M.Sc. BRANCH-I (C): MATHEMATICS (CA)

(SEMESTER PATTERN)

(Under Choice Based Credit System)

REGULATIONS AND SYLLABUS

(For Candidates admitted in the Colleges affiliated to Periyar University from 2017-2018 onwards)

PERIYAR UNIVERSITY

PERIYAR PALKALAI NAGAR

SALEM – 11

M.Sc. BRANCH- I (C): MATHEMATICS (CA)

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10	Dr.G.Sainarayanan, Senior Technical Specialist, HCL Technologies Ltd., Chennai.	**Industrial Personal**
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PERIYAR UNIVERSITY

PERIYAR PALKALAI NAGAR

SALEM – 11

M.Sc. DEGREE PROGRAMME

(Semester System)

FACULTY OF SCIENCE BRANCH – I (C): MATHEMATICS (CA)

(Under Choice Based Credit System)

REGULATIONS AND SYLLABUS

(For Candidates admitted in the Colleges affiliated to Periyar University from 2017-2018 onwards)

1. Objectives of the Course:

In recent days Mathematics is penetrating all fields of human endeavor and therefore it is necessary to prepare the students to cope with the advanced developments in various fields of Mathematics with computing skill. The objectives of this course are the following:

(a) To impart knowledge in advanced concepts and applications in various fields of Mathematics.

(b) To provide wide choice of elective subjects with updated and new areas in various branches of Mathematics to meet the needs of all students.

2. Commencement of this Regulation:

These regulations shall take effect from the academic year 2017-2018, that is, for students who are admitted to the first year of the course during the academic year 2017-2018 and thereafter.

3.Definitions:

Programme : Programme means a course of study leading to the award of the degree in a discipline.

Course : Course refers to the subject offered under the degree Programme.

4. Eligibility for Admission:

A candidate who has passed B.Sc., Mathematics/ B.Sc., Mathematics (Computer Applications) degree of this University or any of the above degree of any other University accepted by the Syndicate as equivalent thereto, subject to such condition as may be prescribed therefore shall be permitted to

appear and qualify for the Master of Science (M.Sc.) Degree Examination in Mathematics (Computer Applications) of this University.

5. Duration of the Course:

The course of study of Master of Science in Mathematics (Computer Applications) shall consist of two academic years divided into four semesters. Each semester consists of 90 working days.

6. Syllabus:

The course of study shall comprise instruction in the following subjects according to the syllabus and books prescribed from time to time. The syllabus of the PG degree Programme has been divided into the following courses:

i. Core Courses,

ii. Elective Courses.

i. Core Courses:

The core courses related to the programme concerned including practicals and project work offered under the programme.

ii. Elective Courses :

There are FOUR Elective Courses offered under the programme related to the major or non major but are to be selected by the students.

7.Credits:

Weightage given to each course of study is termed as **credit.**

8.Credit System:

The weightage of credits are spread over to four different semester during the period of study and the cumulative credit point average shall be awarded based on the credits earned by the students. A total of 92 credits are prescribed for the Post Graduate programme.

9. Course of Study:

The course of study for the degree shall be in Branch-I(C) - Mathematics (Computer Applications) under Choice Based Credit System with internal assessment according to syllabi prescribed from time to time.

10. Structure of the Programme:

SEM.	Core Course	Course Code	Course Title	Hours	Credit	Marks		
						CIA (Int.)	EA (ext.)	Total
I	I	17PMACA01	ALGEBRA	6	5	25	75	100
	II	17PMACA02	REAL ANALYSIS	6	5	25	75	100
	III	17PMACA03	DIFFERENTIAL EQUATIONS	6	5	25	75	100
	IV	17PMACA04	DISCRETE MATHEMATICS	6	4	25	75	100
	V	17PMACA05	MATHEMATICAL SOFTWARES (LATEX AND MATLAB)	6	4	25	75	100
II	VI	17PMACA06	NUMERICAL ANALYSIS	6	4	25	75	100
	VII	17PMACA07	COMPLEX ANALYSIS	6	5	25	75	100
	VIII	17PMACA08	MATHEMATICAL STATISTICS	6	4	25	75	100
	IX	17PMACA09	C++ PROGRAMMING AND DATA STRUCTURE	6	4	25	75	100
	X	17PMACAP01	C++ PROGRAMMING AND DATA STRUCTURE PRACTICAL	4	4	40	60	100
III	XI	17PMACA10	TOPOLOGY	6	5	25	75	100
	XII	17PMACA11	JAVA PROGRAMMING	6	5	25	75	100
	XIII	17PMACA12	OPTIMIZATION TECHNIQUES	6	5	25	75	100
	XIV	17PMACA13	GRAPH THEORY	6	5	25	75	100
	XV	17PMACA14	MEASURE THEORY AND INTEGRATION	6	5	25	75	100
	XVI	17PMACA15	FUNCTIONAL ANALYSIS	6	5	25	75	100
IV	XVII	17PMACA16	DIFFERENTIAL GEOMETRY	6	4	25	75	100
	XVIII	17PMACAP02	JAVA PROGRAMMING PRACTICAL	6	4	40	60	100
	XIX		ELECTIVE (To be Choosen from the given list)	6	4	25	75	100
	XX	17PMACAP03	PROJECT	6	6	-	100	100
			TOTAL		**92**	--	--	2000

(ii) List of Elective Courses:

SEMESTER	PAPER CODE	PAPER TITLE
IV	17PMACAE01	Calculus of Variations and Integral Equations
	17PMACAE02	Number Theory
	17PMACAE03	Database Technology
	17PMACAE04	Fluid Dynamics

11. Examinations:

The examination shall be of **Three Hours** duration for each paper at the end of each semester. The candidate failing in any subject(s) will be permitted to appear for each failed subject(s) in the subsequent examination. Practical examinations for PG course should be conducted at the end of the even semester only. At the end of fourth semester viva-voce will be conducted on the basis of the Dissertation/ Project report by one internal and one external examiner.

12. Question Paper Pattern:

(i) Question Paper Pattern and Marks Distribution for Theory Examination:

TITLE OF THE PAPER

Time: Three Hours **Maximum Marks:** 75

Part – A (10 X 2 = 20 Marks)

Answer **ALL** Questions

(Two Questions from each unit)

Part – B (5 X 5 = 25 Marks)

Answer **ALL** Questions

(Two Questions from each unit with internal choice)

Part – C (3 X 10 = 30 Marks)

Answer any **Three** questions out of **Five** questions

(One question from each unit).

(ii) Question Paper Pattern and Marks Distribution for Practical Examination:

Question Paper Pattern:

There will be ONE question with or without subsections to be asked for the Practical examination. Every question should be chosen from the question bank prepared by the examiner(s). Every fourth student gets a new question i.e. each question may be used for at most three students.

The answer should contain i) Algorithm (A), ii) Flow Chart (F), iii) Program (P), iv) Execution of the Program with correct output (E& OP), and v) viva-voce (V).

Marks Distribution for Practical Examination:

Maximum marks:100

Internal (CIA): 40

External Assessment (EA- Practical Examination): 60

(Practical Written Exam.: 50 Marks (The split up marks of this total marks 50 is, for A-05 , F-05, P-10, E -20 & OP-05 and V-05) and **Record:10Marks)**

13. Dissertation :

(a) Topic:

The topic of the dissertation shall be assigned to the candidate before the beginning of Third Semester and a copy of the same should be submitted to the University for Approval.

(b) No. of copies project / dissertation:

The students should prepare **Three** copies of dissertation and submit the same for the evaluation by Examiners. After evaluation one copy is to be retained in the college library and one copy is to be submitted to the University (Registrar) and the student can have the rest.

(**c) Format to be followed:**

The format of the Project / Dissertation to be prepared and submitted by the students in Semester IV is given below:

Format for the preparation of project work:

(i)Title page *:*

TITLE OF THE PROJECT / DISSERTATION

Project / Dissertation Submitted in partial fulfillment of the requirement for the award of the Degree of

Master of Science in **MATHEMATICS-CA (under Choice Base Credit System)** to the

Periyar University,

Periyar Palkalai Nagar,

Salem -636 011.

By

(Student's Name)

(Register Number)

Under the Guidance of

(Guide Name and Designation)

(College Logo)

(Name of the Department)

(College Address)

(Month and Year).

(ii) Bonafide Certificate:

CERTIFICATE

This is to certify that the dissertation entitled ……submitted in partial fulfillment of the requirement of the award of the Degree of Master of Science in **MATHEMATICS-CA (Under Choice Based Credit System)** to the Periyar University, Salem is a record of bonafide research work carried out by……..under my supervision and guidance and that no part of the dissertation has been submitted for the award of any degree, diploma, fellowship or other similar titles or prizes and that the work has not been published in part or full in any scientific or popular journals or magazines.

Date:

Place: Signature of the Guide

Signature of the Head of the Department

(iii) Acknowledgement:

(Drafted by the student)

(iv) Table of contents:

TABLE OF CONTENTS

Chapter No.	Title	Page No.
1	Introduction	
2	Review of Literature	
3,4,..	Results	
	Summary	
	References	

14. Minimum Marks for Passing:

i) Theory Papers: The candidate shall be declared to have passed the examination if the candidate secures not less than 50 marks in Total (CIA Mark + University Theory Exam Mark) with minimum of 38 marks in the Theory Exam conducted by the University.

The **Continuous Internal Assessment (CIA) Mark** 25 is distributed to four components viz., **Tests, Assignment, Seminar** and **Attendance** as **10, 05, 05** and **05** marks, respectively.

ii) **Practical Paper:** A minimum of 50 marks out of 100 marks in the University examination and the record notebook taken together is necessary for a pass. There is no passing minimum for the record notebook. However submission of record notebook is a must.

iii) **Project Work/Dissertation and Viva-Voce:** A candidate should secure 50% of the marks for pass. The candidate should attend viva-voce examination to secure a pass in that paper.

Candidate who does not obtain the required minimum marks for a pass in a Paper / Practical/ Project/Dissertation shall be declared Re-Appear* (RA) *and he / she has to appear and pass the same at a subsequent appearance.

15. Classification of Successful Candidates:

Candidates who secure not less than 60% of the aggregate marks in the whole examination shall be declared to have passed the examination in **First Class.** All other successful candidate shall be declared to have passed in the **Second Class.** Candidates who obtain 75%of the marks in the aggregate shall be deemed to have passed the examination in the **First Class with Distinction** provided they pass all the examinations prescribed for the course at the first appearance. Candidates who pass all the examinations prescribed for the course in the first instance and within a period of two academic years from the year of admission to the course only are eligible for **University Ranking.**

16. Maximum Duration for the completion of the PG Programme:

The maximum duration for completion of the PG Programme shall not exceed Four Years from the year of admission.

17. Transitory Provision:

Candidates who were admitted to the PG course of study before 2017-2018 shall be permitted to appear for the examinations under those regulations for a period of three years, that is, up to end inclusive of the examination of April / May 2020. Thereafter, they will be permitted to appear for the examination only under the regulations then in force.

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SYLLABUS - CORE COURSES

SEMESTER - I

CORE PAPER – I

ALGEBRA

Paper Code : 17PMACA01 / 17PMA05 **Max. Marks: 75**

Credit: 05

Unit I:

Another Counting Principle-Sylows Theorem.

(Chapter 2: Sections 2.11 & 2.12 in [1]).

Unit II:

Direct Product - Finite Abelian Groups.

(Chapter 2: Sections 2.13 & 2.14 in [1]).

Unit III:

Modules and homomorphisms-Classical isomorphism theorems-Direct sums and products – Finitely generated and free modules.

(Chapter 4 : Sections 4.4 and 4.5 in [2])

Unit IV:

Elements of Galois Theory-Solvability by Radicals-Galois Group over the Rationals.

(Chapter5 Sections 5.6, 5.7 and 5.8 in [1]).

Unit V:

Finite Fields-Wedderburn's Theorem on Finite Division Rings - A Theorem of Frobenius .

(Chapter 7: Sections 7.1, 7.2, and 7.3 in [1]).

Text book:

[1] I.N Herstein, Topics in Algebra, 2nd Edition, John Wiley and Sons, New York, 2003 (For Units I, II, IV and V).

[2] Michiel Hazewinkel, Nadiya Gubareni and V.V.Kirichenko,Algebras,Rings and Modules, Vol.1, Springer Internatinal Edition,2011(Indian Print).

Books for Reference:

1.S.Lang, Algebra, 3rd Edition, Addison Wesley, Mass 1993.

2. John B.Fraleigh,A first course in abstract Algebra, Addison Wesley, Mass 1982.

3. M.Artin, Algebra, Prentice Hall of India, New Delhi, 1991.

4. Bhupendra Singh, Advanced Abstract Algebra, Pragati Prakashan, Meerat, First Edition 2006.

SEMESTER - I

CORE PAPER –II

REAL ANALYSIS

Paper Code : 17PMACA02/17PMA02 **Max. Marks: 75**

Credit:05

Unit I: Differentiation:

Differentiation - The derivative of a real function – Mean Value Theorems – The continuity of the Derivative – L' Hospital's Rule – Derivatives of Higher order – Taylor's theorem – Differentiation of Vector–valued functions.

(Chapter 5: Page Number: 103 – 119).

Unit II: Riemann – Stieltjes Integral:

The Riemann - Stieltjes Integral – Definition and Existence of the Integral – Properties of the Integral – Integration and Differentiation – Integration of Vector–Valued functions – Rectifiable curves.(Chapter 6: Page Number: 120 – 142).

Unit III: Sequences and Series of Functions:

Sequences 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 – Stone Weierstrass Theorem.

(Chapter 7: Page Number: 143 – 171).

Unit IV: Some Special Functions:

Some Special Functions – Power Series – The Exponential and Logarithmic functions – The Trigonometric functions- The algebraic completeness of the complex field – Fourier series - The Gamma function. (Chapter 8: Page Number: 172 – 203).

Unit V:

Linear transformations, Differentiation, The Contraction Principle, The Inverse Function Theorem, The Implicit Function Theorem. (Chapter 9).

Text book:

1.Walter Rudin – Principles of Mathematical Analysis, 3rd edition, Mc Graw Hill Book Co., Kogaskusha, 1976.

Books for Reference:

1. T.M. Apostol, Mathematical Analysis, Narosa Publ. House, New Delhi, 1985.
2. H.L.Royden, Real Analysis, Macmillian Publn.Co.Inc.4th Edition, New York,1993
3. V.Ganapathy Iyer, Mathematical Analysis, Tata McGraw Hill, New Delhi,1970.

SEMESTER - I

CORE PAPER –III

DIFFERENTIAL EQUATIONS

Paper Code: 17PMACA03 **Max. Marks :75**

Credit :05

Unit I: General Solution of Homogeneous Equation:

The general solution of the Homogenous Equation – The use of known solution to find another – The method of variation of parameter – Power series solutions. (Chapter 3 : Sections 15,16,17,19) (Chapter 5: Sections 26 and 27).

Unit II: Power Series Solutions:

Regular – Singular Points – Gauss's Hyper Geometric Equation – The point at infinity– Legendre Polynomial – Bessel functions – Properties of Legendre's Polynomials –Bessel Functions.
(Chapter 5: Sections 28-31; Chapter 6: Sections 32-35).

Unit III: Existence and Uniqueness:

Linear systems of first order equations – Homogenous equations with constant coefficients – The exact and uniqueness of solutions of initial value problem for first order ordinary differential equation. The method of successive approximations –Picard's theorem.
(Chapter 7: Sections 37-38 ; Chapter 11: Sections 55 and 56).

Unit IV: First Order Partial Differential Equations:

Partial differential equations of first order in two independent variables – Formulation – Solution – Integral surfaces passing through a curve – Surfaces orthogonal to a given system – Compactibility – Classification of solutions of first order equation –Solutions of non –linear equation – Charpits Method – Jacobi Method. (Chapter 1: Sections 1.1 – 1.9).

Unit V: Second Order Partial Differential Equations:

Origin of second order partial differential equations – Linear partial differential equations – Method of solving of second order partial differential equations –Canonical forms – Adjoint operator.
(Chapter 2 : Sections 2.1 - 2.6).

Text Books:

1. G.F.Simmons – Differential Equations with Application and Historical Notes – Tata McGraw Hill, New Delhi,1984. (For Units I, II and III)

2. J.N. Sharma and K.Singh, Partial Differential Equations for Engineers and Scientist, Narosha Publishing House, New Delhi, 2000 (For Units IV and V)

Books for Reference:

1. I.N. Sneddon, Elements of Partial Differential Equations, McGraw Hill, New Delhi,1983.

2. Shepley L.Ross, Differential Equations, Joh Wiley & Sons, New York,1984.

3. D. Somasundaram, Ordinary Differential Equations, Narosa Publishing House, Chennai – 2002.

SEMESTER - I

CORE PAPER –IV

DISCRETE MATHEMATICS

Paper Code: 17PMACA04/17PMAE03 **Max. Marks :75**

Credit :04

Unit I: The Foundations: Logic and Proofs :

Propositional - Applications of Propositional -Propositional Equivalences - Predicates and Quantifiers. (Chapter 1: Sections 1.1 - 3.3)

Algorithms: The Growth of Functions. (Chapter 3: Section 3.2).

Unit II: Counting:

The Basics of Counting- The Pigeonhole Principle -Permutations and Combinations - Generalized Permutations and Combinations - Generating Permutations and Combinations.

(Chapter 5: Sections 5.1- 5.3, 5.5 and 5.6).

Unit III : Advanced Counting Techniques:

Applications of Recurrence Relations - Solving Linear Recurrence Relations-Generating Functions .

(Chapter 6: Sections 6.1, 6.2 and 6.4)

Unit IV:Boolean Algebra:

Boolean Functions- Representing Boolean Functions - Logic Gates - Minimization of Circuits.

(Chapter 10: Sections 10.1 -10.4)

Unit V: Modeling Computation:

Finite-State machines with Output- Finite-State machines with No Output-Turing Machines.

(Chapter 12: Sections 12.2, 12.3 and 12.5)

Text Book:

1. **Kenneth H.Rosen**, Discrete Mathematics and it's Applications,7^{th} Edition, WCB / McGraw Hill Education , New York,2008.

Books for Reference:

1.**J.P. Trembley** and **R.Manohar**, Discrete Mathematical Structures applications to Computer Science, Tata McGraw Hills.

2.T.Veerarajan,Discrete Mathematics with Graph Theory and Combinatorics, Tata McGraw Hills Publishing Company Limited ,7^{th} Reprint,2008.

SEMESTER - I

CORE PAPER –V

MATHEMATICAL SOFTWARES

(LATEX AND MATLAB)

Paper Code: 17PMACA05 **Max. Marks :75**

Credit :04

Unit I:

Commands and Environments–Command names and arguments, Environments, Declarations, Lengths, Special Characters, Fragile Commands, Exercises. Document Layout and Organization – Document class, Page style, Parts of the document, Table of contents.

Unit –II

Displayed Text - Changing font, Centering and indenting, Lists, Generalized lists, Theorem–like declarations, Tabulator stops, Boxes. Tables, Printing literal text, Footnotes and Marginal notes. Drawing pictures with LATEX.

Unit III:

Mathematical Formulas – Mathematical environments, Main elements of math mode, Mathematical symbols, Additional elements, Fine–tuning mathematics.

Unit – IV

Introduction - Basics of MATLAB, Input – Output, File types – Platform dependence – General commands.

Interactive Computation: Matrices and Vectors – Matrix and Array operations – Creating and Using *Inline* functions – Using Built-in Functions and On-line Help – Saving and loading data – Plotting simple graphs.

Unit – V

Programming in MATLAB: Scripts and Functions – Script files – Functions files-Language specific features – Advanced Data objects.

Text Books:

1.H. Kopka and P.W. Daly, A Guide to LATEX by, Third Edition, Addison – Wesley, London, 1999.

For Unit I : Chapter 2 : Sections : 2.1-2.7; Chapter 3 : Sections : 3.1-3.6, 4.1-4.7

Unit II : Chapter 4 : Sections : 4.8-4.10 & 6.1.

Unit III : Chapter 5: Sections : 5.1-5.5.

2. RUDRA PRATAP, Getting Started with MATLAB-A Quick Introduction for Scientists and Engineers, Oxford University Press, 2003. (For Unit IV and Unit V)

Books for Reference:

1.William John Palm, Introduction to Matlab 7 for Engineers, McGraw-Hill Professional, 2005.

2.Dolores M. Etter, David C. Kuncicky, Introduction to MATLAB 7, Prentice Hall, 2004

SEMESTER -II

CORE PAPER –VI

NUMERICAL ANALYSIS

Paper Code: 17PMACA06 /17PMAE01 **Max. Marks :75**

Credit :04

Unit I :Numerical Solutions to ordinary differential equation:

Numerical solutions to ordinary differential equation – Power series solution –Pointwise method – Solution by Taylor's series – Taylor's series method for simultaneous first order differential equations – Taylor's series method for Higher order Differential equations – Predictor – Corrector methods – Milne's method –Adam – Bashforth method.

(Chapter 11: Sections 11.1 to 11.6 and 11.8 to 11.20).

Unit II :Picard and Euler Methods:

Picard's Method of successive approximations – Picard's method for simultaneous first order differential equations – Picard's method for simultaneous second order differential equations – Euler's Method – Improved Euler's method – Modified Euler's Method.

(Chapter 11: Sections 11.7 to 11.12).

Unit III : Runge – Kutta Method:

Runge's method – Runge-Kutta methods – Higher order Runge-Kutta methods-Runge-Kutta methods for simultaneous first order differential equations – Runge-Kutta methods for simultaneous second order differential equations.

(Chapter 11: Sections 11.13 to 11.17).

Unit IV :Numerical Solutions to Partial Differential Equations:

Introduction Difference Quotients – Geometrical representation of partial differential quotients – Classifications of partial differential equations – Elliptic equation –Solution to Laplace's equation by Liebmann's iteration process.

(Chapter 12: Sections 12.1 to 12.6).

Unit V :Numerical Solutions to Partial Differential Equations (contd.)

Poisson equation – its solution – Parabolic equations – Bender – Schmidt method –Crank – Nicholson method – Hyperbolic equation – Solution to partial differential equation by Relaxation method.

(Chapter 12: Sections 12.7 to 12.10).

Text Book:

1.V.N Vedamurthy and Ch. S.N.Iyengar, Numerical Methods, Vikas Publishing House Pvt. Ltd., 1998.

Books for Reference:

1. S.S. Sastry, Introductory methods of Numerical Analysis, Printice of India, 1995.

2. C.F.Gerald, and P.O. Wheathy, Applied Numerical Analysis, Fifth Edition, Addison Wesley, 1998.

3. M.K. Venkatraman, Numerical methods in Science and technology, National Publichers Company, 1992.

4. P. Kandasamy, K. Thilagavathy, K. Gunavathy, Numerical Methods, S. Chand & Company, 2003.

SEMESTER -II

CORE PAPER –VII

COMPLEX ANALYSIS

Paper Code: 17PMACA07 **Max. Marks :75**

Credit :05

Unit I:Power series expansions:

Weiestrass's theorem – The Taylor series – The Laurent's series, partial fractions –Infinite products – Canonical products.

(Chapter 5: Sections 1 and 2.1, 2.2, & 2.3).

Unit II: Entire functions: Jenson's formula – Hadamards theorem.

Normal Families: Equicontinuity – Normality and compactness – Arzela's theorem – Families of analytic functions – The classical definition.

(Chapter 5: Sections 3 and 5).

Unit III:Conformal Mapping:

The Riemann Mapping Theorem, Conformal Mapping of Polygons. A closure look at harmonic functions.(Chapter 6 : Sections 1,2 and 3).

Unit IV: Elliptic functions :

Simply periodic functions, Representation by exponentials – The Fourier development – Functions of finite order. Doubly periodic functions : The period module –Unimodular transformation the canonical basis – General properties of elliptic functions (Chapter 7 : Sections 1 and 2)

Unit V:The Weiestrass's theorem :

The Weiestrass's function – The functions $\zeta(z)$ and $\sigma(z)$. The differential equation –Problems (Chapter 7: Sections 3.1, 3.2 & 3.3)

Text book:

1.L.V.Ahlfors, Complex Analysis, 3rd Edition, McGraw Hill Indian Edition, New Delhi, 1979.

Books for Reference:

1. J.B.Conway, Functions of one complex variable, Narosa publishing house, New Delhi, 1980

2. S. Ponnusamy, Foundations of Complex Analysis , Narosa Publishing house, New Delhi , 2004.

SEMESTER -II

CORE PAPER –VIII

MATHEMATICAL STATISTICS

Paper Code: 17PMACA08 **Max. Marks :75**

Credit :04

Unit I: Probability and Random Variables:

Probability – Axioms – Combinatorics, Probability on finite sample spaces –Conditional probability and Baye's theorem - Independence of events – Random variables – Probability distribution of a random variable – Discrete and Continuous random variables – Function of a random variable. (Chapter 1: Sections 1.3 to 1.6 and Chapter 2: Sections 2.2 to 2.5).

Unit II: Moments and Generating Functions:

Moments of a distribution function – Generating functions – Some moment inequalities. (Chapter 3: Sections 3.2 to 3.4).

Unit III: Multiple Random Variables:

Multiple random variables – Independent random variables – Functions of several random variables. (Chapter 4: Sections 4.2 to 4.4).

Unit IV: Multiple Random Variables (Contd.):

Covariance, Correlation and Moments – Conditional expectation – Some discrete distributions – Some continuous distributions. (Chapter 4: Sections 4.5 and 4.6 and Chapter 5: Sections 5.2 to 5.3).

Unit V:Limit Theorems:

Modes of convergence – Weak law of large numbers – Strong law of large numbers –Central Limit Theorems. (Chapter 6: Sections 6.2 to 6.4 and 6.6).

Text Book:

1.V.K. Rohatgi ,Statistics, John Wiley Pvt. Singapore, 2001.

Books for Reference:

1. G.G. Roussas, A First Course in Mathematical Statistics, Addition Wesley Publ. Co. Mass, 1973.
2. M. Fisz, Probability Theory and Mathematical Statistics, John Wiley, New York, 1963.
3. E.J. Dudewisg and S.N. Mishra, Modern Mathematical Statistics, John Wiley, New York, 1988.

SEMESTER -II

CORE PAPER –IX

PROGRAMMING IN C++ AND DATA STRUCTURE

Paper Code: 17PMACA09 **Max. Marks :75**

Credit :04

Unit I: Beginning with C++ - What is C++ ?- Application of C++ - A simple C++ Program – More C++ Statements – An Example with class – Structure of C++ Program.

Token, Expressions and control structures: Tokens – Keywords – Identifiers and Constants – Basic Data types – User defined Data types – Derived data types – Symbolic Constants in C++ - Scope Resolution Operator – Manipulators – Type cost operator – Expressions and their types – Special assignment expressions – Implicit Conversions – Operator Overloading – Operator precedence – Control Structure.

Unit – II: Function in C++:

Main Function – Function prototyping – Call by reference – Return by reference – Inline functions – default arguments – Const arguments – Function overloading – Friend and Virtual functions – Math library function.

Class and Objects: Specifying a class – Defining member functions – A C++ program with class – Making an outside function inline – Nesting of member functions – Private member functions – Arrays within a class – Memory allocations for objects – Static data member – Static member functions – Array of the object – Object as function arguments – Friendly functions – Returning objects – Const member functions – Pointer to members – Local classes.

Unit III: Constructors and Destructors:

Constructors – Parameterized Constructors in a class – Multiple constructors in a class – Constructors with default arguments – Dynamic Initialization of objects – Copy constructors – Dynamic Constructors – Constructing Two-dimensional arrays – Const objects – Destructors. Operator overloading and Type conversions: Defining operator overloading – overloading unary operators – overloading binary operators - overloading binary operators using friends – Manipulation of strings using operators – Rules for overloading operators – Type conversions.

Unit IV:

Definitions of a Data Structure – Primitive and composite data types – Arrays –Operations on Arrays – Application stock – Infix – Postfix – Conversion – Recursive maze problem.

Unit V:

Queues – Operations on Queues – Application – Circular Queues – Single linked list – Operations – Applications – Representation of a polynomial – Polynomial addition – Doubly linked list – Operations – Applications – Ordering of books in library.

Text Books:

1.E. Balagurusamy, Object Oriented Programming in C++, Tata McGraw Hill Publishing co. Ltd., New Delhi, 1999.(For Units I,II and III).

2.E. Horowitz and Sahani, Fundamentals of Computer Algorithm, CBS Publishers, New Delhi, 1984. (For Units IV, and V)

Books for Reference:

1. S.B. Lipman and J.Lafer, C++ Primer, Addition Wesley, Mass., 1998.

2. L. Sarat, Data Processing Logic, McGraw Hill, Singapore, 1985.

3. D. Ravichandran, Object Oriented Programming with C++, Tata McGraw Hill Publishing Co.Ltd., New Delhi, 1998.

SEMESTER -II

CORE PAPER –X

PROGRAMMING IN C++ AND DATA STRUCTURE PRACTICALS

Paper Code: 17PMACAP01 **Max. Marks :75**

Credit :04

1. Arrays

1.1. Operations on Arrays

1.2. Linear Search

1.3. Binary Search

2. Sorting

2.1. Bubble Sort

2.2. Selection Sort

2.3. Insertion Sort

2.4. Shell Sort

2.5. Quick Sort

2.6. Heap Sort

3. Stacks and Queues

3.1. Operations on Stack

3.2. Operations on Queue

3.3. Operations on Priority Queue

3.4. Operations on Circular Queue

4. Linked Lists

4.1. Singly Linked List

4.2. Doubly Linked List

4.3. Double-ended List

5. Recursion

5.1. Towers of Honoi

5.2. Merge Sort

6. Binary Tree Traversal

Text Books:

1. E. Balagurusamy, Object Oriented Programming in C++, Tata McGraw Hill Publishing co. Ltd., New Delhi, 1999

2. E. Horowitz and Sahani, Fundamentals of Computer Algorithm, CBS Publishers, New Delhi, 1984

Books for Reference:

1. S.B. Lipman and J.Lafer, C++ Primer, Addition Wesley, Mass., 1998.

2. L. Sarat, Data Processing Logic, McGraw Hill, Singapore, 1985.

3. D. Ravichandran, Object Oriented Programming with C++, Tata McGraw Hill Publishing Co.Ltd., New Delhi, 1998.

SEMESTER -III

CORE PAPER –XI

TOPOLOGY

Paper Code: 17PMACA10/17PMA09 **Max. Marks :75**

Credit :05

Unit I:Topological spaces:

Topological spaces - Basis for a Topology – The Order Topology - The Product Topology on XxY – The Subspace Topology – Closed sets and Limit points. (Chapter 2: Sections 12 to 17).

Unit II: Continuous functions :

Continuous functions – The Product Topology – The Metric Topology.

(Chapter 2: Sections 18 to 21).

Unit III: Connectedness:

Connected spaces – Connected Subspaces of the real line – Components and Local Connectedness. (Chapter 3: Sections 23 to 25).

Unit IV: Compactness:

Compact spaces – Compact Subspace of the real line –Limit Point Compactness –Local Compactness. (Chapter 3: Sections 26 to 29).

Unit V:Countability and Separation axioms:

The Countability Axioms – The Separation Axioms – Normal Spaces – The Urysohn Lemma – The Urysohn Metrization Theorem – The Tietz Extension Theorem. (Chapter 4: Sections 30 to 35).

Text Book:

1.James R.Munkres – Topology, 2nd edition, Prentice Hall of India Ltd., New Delhi,2005

Books for Reference:

1. J. Dugundji, Topology, Prentice Hall of India, New Delhi,1975.

2. G.F.Simmons, Introduction to Topology and Modern Analysis, McGraw Hill Book Co.New York 1963.

3. S.T. Hu, Elements of General Topology, Holden Day, Inc. New York, 1965.

SEMESTER -III

CORE PAPER –XII

JAVA PROGRAMMING

Paper Code: 17PMACA11 **Max. Marks :75**

Credit :05

Unit I:

Java Tokens – Java statements – Constants – Variables – Data types. [Chapters 3 and 4]

Unit II:

Operators – Expressions – Decision making and Branching. [Chapters 5,6, and 7]

Unit III:

Classes – Objects – Methods – Arrays – Strings – Vectors – Multiple Inheritance .[Chapter 8,9 and 10]

Unit IV:

Multithreaded Programming – Managing Errors and Exceptions. [Chapters 12 and 13]

Unit V:

Applet Programming. [Chapter 14]

Text Book:

1.E. Balagurusamy, Programming with Java – A primer, Tata McGraw Hill Publishing Company Limited, New Delhi, 1998.

Books for Reference:

1. Mitchell Waite and Robert Lafore, Data Structures and Algorithms in Java, Techmedia (Indian Edition), New Delhi, 1999.

2. Adam Drozdek, Data Structures and Algorithms in Java, (Brown/Cole), Vikas Publishing House, New Delhi, 2001.

SEMESTER -III

CORE PAPER –XIII

OPTIMIZATION TECHNIQUES

Paper Code: 17PMACA12/17PMAE08 **Max. Marks :75**

Credit :05

Unit I:Integer Linear Programming:

Introduction – Illustrative applications Integer Programming solution algorithms: Branch and Bound (B & B) Algorithm – zero – One implicit enumeration algorithm –Cutting plane Algorithm. (Chapter 9: Sections 9.1, 9.2, 9.3.1., 9.3.2 and 9.3.3).

Unit II: Deterministic Dynamic Programming:

Introduction – Recursive nature of computations in DP – Forward and Backward Recursion – Selected DP applications Cargo – Loading model – Work Force Size Model – Equipment Replacement Model – Investment Model – Inventory Models.

(Chapter 10: Sections 10.1,10.2, 10.3,10.4.1,10.4.2 ,10.4.3 ,10.4.4 and 10.4.5).

Unit III: Decision analysis and Games:

Decision environment – Decision making under certainty (Analytical Hierarchy approach) Decision making Under Risk – Expected Value Criterion – Variations of the Expected Value Criterion – Decision under uncertainty.

Game theory – optimal solution of Two – Person Zero – Sum games – Solution of Mixed Strategy games. (Chapter 14: Sections 14.1,14.2,14.3.1,14.3.2,14.4,14.5.1and 14.5.2).

Unit IV: Simulation modeling:

What is simulation – Monte Carlo Simulation – Types of Simulation – Elements of Discrete Event Simulation – Generic definition of Events – Sampling from Probability Distributions. Methods for gathering statistical observations – Sub Interval Method –Replication Method – Regenerative (Cycle) Method – Simulation Languages (Chapter 18: Sections 18.1,18.2,18.3,18.4.1,18.4.2,18.5, 18.6,18.7.1, 18.7.2,18.7.3 and 18.8).

Unit V: Nonlinear programming algorithms:

Unconstrained Non Linear algorithms – Direct Search method – Gradient method.

Constrained algorithms: Separable programming – Quadratic programming –Geometric programming – Stochastic Programming – Linear Combinations Method –SUMT Algorithm

(Chapter 21: Sections : 21.1.1, 21.1.2, 21.2.1, 21.2.2, 21.2.3, 21.2.4, 21.2.5 and 21.2.6)

Text Book:

1. Hamdy A. Taha, Operations Research An Introduction, 6th Edison, University of Arkansas Fayetteville.

Books for Reference:

1. F.S. Hillier and G.J. Lieberman Introduction to Operation Research 4th edition, Mc Graw Hill Book Company, New York, 1989.

2. Philips D.T.Ravindra A. and Solbery.J. Operations Research, Principles and Practice John Wiley and Sons, New York.

3. B.E.Gillett, Operations research – A Computer Oriented Algorithmic Approach,TMH Edition, New Delhi, 1976.

SEMESTER -III

CORE PAPER –XIV

GRAPH THEORY

Paper Code: 17PMACA13/17PMA14 **Max. Marks :75**

Credit :05

Unit I: Basic Results: Introduction-Basic Concepts-Subgraphs-Degrees of Vertices - Paths and Connectedness - Automorphism of a Simple Graph. (Chapter 1: Sections 1.1 - 1.6).

Directed Graphs: Introduction-Basic Concepts-Tournaments.(Chapter 2 : Sections 2.1 - 2.3).

Unit II: Connectivity and Trees:

Connectivity: Introduction-Vertex cut and Edge Cut-Connectivity and Edge Connectivity. (Chapter 3: Sections 3.1- 3.3).

Trees: Introduction-Definition, Characterization and Simple Properties-Centers and Centroids-Cutting the Number of Spanning Trees-Cayley's Formula. (Chapter 4: Sections 4.1- 4.5).

Unit III : Independent Sets, Matchings and Cycles:

Independent Sets and Matchings: Introduction-Vertex-Independent Sets and Vertex Coverings-Edge-Independent sets-Matchings and Factors-Matchings in Bipartite Graphs.
(Chapter 5: Sections 5.1- 5.5).

Cycles: Introduction-Eulerian Graphs-Hamiltonian Graphs. (Chapter 6: Sections 6.1- 6.3).

Unit IV: Graph Colorings:

Introduction-Vertex colorings-Critical Graphs-Edge colorings of Graphs-Kirkman's Schoolgirl-Problem-Chromatic Polynomials.

(Chapter 7: Sections 7.1 ,7.2 ,7.3 (7.2.1 & 7.2.3 only) ,7.6, 7.8, and 7.9).

Unit V:Planarity:

Introduction- Planar and Nonplanar Graphs –Euler Formula and its Consequences-K_5 and $K_{3,3}$ are Nonplanar Graphs – Dual of a Plane Graph- The Four-Color Theorem and the Heawood Five-Color Theorem-Hamiltonian Plane Graphs-Tait Coloring.(Chapter 8: Sections 8.1 - 8.6 ,8.8 and 8.9).

Text Book:

1.R.Balakrishnan and K.Ranganathan, Text Book of Graph Theory, 2nd Edition, Springer, New York,2012.

Books for Reference:

1. J.A.Bondy and U.S.R. Murty, Graph Theory with Applications, North Holland, New York, 1982.

2.Narasing Deo, Graph Theory with Application to Engineering and Computer Science, Prentice Hall of India, New Delhi. 2003.

3. F. Harary, Graph Theory, Addison – Wesely Pub. Co. The Mass. 1969.

4. L. R.. Foulds, Graph Theory Application, Narosa Publ. House, Chennai, 1933.

SEMESTER -III

CORE PAPER –XV

MEASURE THEORY AND INTEGRATION

Paper Code: 17PMACA14 /17PMA10 **Max. Marks :75**

Credit :05

Unit I: Lebesgue Measure:

Lebesgue Measure – Introduction – Outer measure – Measurable sets and Lebesgue measure – Measurable functions – Little Woods' Three Principle. (Chapter 3: Sections 1, 2, 3, 5 and 6).

Unit II: Lebesgue Integral:

Lebesgue integral – The Riemann integral – Lebesgue integral of bounded functions over a set of finite measure – The integral of a nonnegative function – The general Lebesgue integral.
(Chapter 4: Sections 1 to 4).

Unit III: Differentiation and Integration:

Differentiation and Integration – Differentiation of monotone functions – Functions of bounded variation – Differentiation of an integral – Absolute continuity. (Chapter 5: Sections 1 to 4).

Unit IV :General Measure and Integration:

General Measure and Integration – Measure spaces – Measurable functions – Integration – Signed Measure – The Radon – Nikodym theorem. (Chapter 11: Sections 1, 2, 3, 5 and 6).

Unit V:Measure and Outer Measure

Measure and outer measure – outer measure and measurability – The Extension theorem – Product measures. (Chapter 12: Sections 1, 2 and 4)

Text Book:

1.H.L.Royden, Real Analysis, Mc Millian Publ. Co. New York 1993.

Books for Reference:

1. G. de Barra, Measure Theory and integration, Wiley Eastern Ltd, 1981.

2. P.K. Jain and V.P. Gupta, Lebesgue Measure and Integration, New Age Int. (P) Ltd., New Delhi, 2000.

3. Walter Rudin, Real and Complex Analysis, Tata McGraw Hill Publ. Co. Ltd., New Delhi, 1966.

SEMESTER -IV

CORE PAPER –XVI

FUNCTIONAL ANALYSIS

Paper Code: 17PMACA15 /17PMA12 **Max. Marks :75**

Credit :05

Unit I: Banach Spaces:

Banach Spaces – Definition and examples – Continuous linear transformations – Hahn Banach theorem. (Chapter 9: Sections 46 to 48).

Unit II: Banach Spaces and Hilbert Spaces:

The natural embedding of N in N** - Open mapping theorem – Conjugate of an operator – Hilbert space – Definition and properties. (Chapter 9: Sections 49 to 51; Chapter 10: Section 52).

Unit III: Hilbert Spaces:

Orthogonal complements – Orthonormal sets – Conjugate space H* - Adjoint of an operator (Chapter 10: Sections 53 to 56).

Unit IV: Operations on Hilbert Spaces:

Self adjoint operator – Normal and Unitary operators – Projections.

(Chapter 10: Sections 57 to 59).

Unit V:Banach Algebras:

Banach Algebras – Definition and examples – Regular and simple elements – Topological divisors of zero – Spectrum – The formula for the spectral radius – The radical and semi simplicity. (Chapter 12 : Sections 64 to 69).

Text Book:

1. G.F.Simmons, Introduction to Topology and Modern Analysis, McGraw Hill Inter. Book Co. New York 1963.

Books for Reference:

1. W. Rudin, Functional Analysis, Tata McGraw Hill Publ. Co. New Delhi, 1973.

2. H.C. Goffman and G.Fedrick, First Course in Functional Analysis, Prentice Hall of India , New Delhi 1987.

3. D. Somasundaram, Functional Analysis S. Viswanathan Pvt.Ltd., Chennai,1994.

SEMESTER -IV

CORE PAPER –XVII

DIFFERENTIAL GEOMETRY

Paper Code: 17PMACA16/17PMAE05 **Max. Marks :75**

Credit :04

Unit I:Theory of Space Curves:

Theory of space curves – Representation of space curves – Unique parametric representation of a space curve – Arc-length – Tangent and oscuating plane –Principle normal and binormal – Curvature and torsion – Behaviour of a curve near one of its points – The curvature and torsion of a curve as the intersection of two surfaces. (Chapter 1: Sections 1.1 to 1.9).

Unit II: Theory of Space Curves (Contd.):

Contact between curves and surfaces – Osculating circle and osculating sphere – Locus of centre of spherical curvature – Tangent surfaces – Involutes and Evolutes –Intrinsic equations of space curves – Fundamental Existence Theorem – Helices.(Chapter 1 : Sections 1.10 to 1.13 and 1.16 to 1.18).

Unit III: Local Intrinsic properties of surface:

Definition of a surface – Nature of points on a surface – Representation of a surface –Curves on surfaces – Tangent plane and surface normal – The general surfaces of revolution – Helicoids – Metric on a surface – Direction coefficients on a surface. (Chapter 2 : Sections 2.1 to 2.10).

Unit IV: Local Intrinsic properties of surface and geodesic on a surface:

Families of curves – Orthogonal trajectories – Double family of curves – Isometric correspondence – Intrinsic properties – Geodesics and their differential equations –Canonical geodesic equations – Geodesics on surface of revolution. (Chapter 2: Sections 2.11 to 2.15 and Chapter 3: Sections 3.1 to 3.4).

Unit V: Geodesic on a surface:

Normal property of Geodesics – Differential equations of geodesics using normal property – Existence theorems – Geodesic parallels – Geodesic curvature – Gauss Bonnet Theorems – Gaussian curvature – Surface of constant curvature. (Chapter 3: Sections 3.5 to 3.8 and Sections 3.10 to 3.13).

Text Book:

1.D. Somasundaram, Differential Geometry, Narosa Publ. House, Chennai, 2005.

Books for Reference:

1. T. Willmore, An Introduction to Differential Geometry, Clarendan Press, Oxford, 1959.
2. D.T Struik, Lectures on Classical Differential Geometry, Addison – Wesely, Mass. 1950.
3. J.A. Thorpe, Elementary Topics in Differential Geometry, Springer – Verlag, New York, 1979.

SEMESTER -IV

CORE PAPER –XVIII

JAVA PROGRAMMING PRACTICAL

Paper Code: 17PMACAP02 **Max.Marks :75**

Credit :04

Section 1. Classes, Objects, Inheritance, Interface

1. Write a program that randomly fills a 3 by 4 array and prints the largest and smallest values in the array.

2. Design a class to represent a bank Account, Include the following members: Data Members: Methods:

1. Name of the Depositor 1. To assign initial values.

2. Account Number 2. To deposit an amount.

3. Type of account 3. To withdraw an amount after checking the balance.

4. Balance 4. To display the name and balance.

Write a Java program for handling 10 customers.

3. Java lacks a complex data type. Write a complex class that represents a single Complex number and includes methods for all the usual operation, i.e. addition, subtraction, multiplication, and division.

4. Create a class called Publication. Create class Tape and class Book from Publication. Describe properties for subclasses. Create an array of publication references to hold combination of books and tapes.

5. Assume that the test results of a batch of students are stored in 3 different classes. Class Student stores the Roll number. Class test stores the marks obtained in two subjects and Class Result contains the total marks. The Class Result can inherit the details of marks and Roll Number of students. The Weightage is stored in a separate interface Sports. Implement the above multiple inheritance problem by using interface. Section 2. Exception Handling, Multithreading and Packages

6. Write a Java program to handle different types of exceptions using try, catch and finally statements.

7. Write a Java program to implement the behavior of threads.

a. To create and run threads.

b. To suspend and stop threads.

c. To move a thread from one state to another

d. By assigning a priority for each thread.

8. Create two Threads subclasses, one with a sun() that starts up, captures the handle of the second Thread object and then calls wait(). The other class run() should call notifyall() for the first Thread after

some number of seconds have passed, so that the first thread after some seconds have passed, so the first thread after some number of seconds have passed, so that the first thread can print out a message.

9. Create a thread to copy the contents of one file to another file. Write a program to implement this thread. Create multiple threads within the program to do multiple file copies.

10. Create three classes Protection, Derived and SamePackage all in same package. Class Protection is a base class for the class Derived and SamePackage is a seperate class. Class Protection has three variables each of type private, protected and public. Write a program that shows the legal protection modes of all the different variables.

Section 3. Applet Programming

11. Write an applet to draw the following shapes:

a. Cone

b. Cylinder

c. Cube

d. Square inside a circle

e. Circle inside a square

12. Design applet to display bar chart for the following table, which shows the annual turnover of XYZ Company during the period 1997 to 2000.

Year : 1997 1998 1999 2000

Turnover (in Crore) : 110 150 100 180

13. Creating a Java applet, which finds palindromes in sentences. Your applet will have two input controls; one input will be a text field for entering sentences, the other input will be a text field or scroll bar for selecting the minimum length a palindrome to be shown. Your applet will output the first 10 palindromes it finds in the sentence.

14. Write a program which displays a text message coming down the screen by moving left to right and modify the above program instead of text moving from left to right it moves top to bottom.

15. Create a thread in an applet that draws an image and makes it move along the screen.

Section 4: AWT Forms Design Using Frames

16. Create a frame with two text fields and three buttons (Cut, Copy & Paste). Data entered in the first text field should response, according to the buttons clicked.

17. Create a frame that contains 3 text fields and four buttons for basic arithmetic operations. You have to enter two numbers in first two text fields. On clicking the respective button that answer should be displayed in the last text field.

18. Create a frame with check box group containing Rectangle, Circle, Triangle, Square. If the particular value is true then the corresponding shape should be displayed.

19. Using AWT create a frame, which contains four-text field name, age, sex and qualification lay out using the flow layouted manager. Run the program and give the values of all text fields in the command line. Initially all the values of text field should be blank. On clicking the click button all the text fields should contain the command line inputs.

20. A car company called Maruthi is selling four models of cars. They are shown below:

Code	Car	Model	Price
800	Maruthi	800	Rs 2.14 Lakhs
1000	Maruthi	1000	Rs 3.72 Lakhs
Esteem	Maruthi	Esteem	Rs 3.69 Lakhs
Zen	Maruthi	Zen	Rs 3.91 Lakhs

Design a frame with 4 buttons called 800, 1000, Esteem, Zen. When we click a button the details of a particular model must appeared in an exclusive background color, text color and font.

Section-5: Networking, Socket and Servlets Programming

21. Practice with client-Servers and IO: Modify Data Server to watch for "Send Text" request read a file from to "Send Data" for the "Send Text" request read a file from disk and send it back to the client. Add a button to Data Client interface that sends the text request when pushed. Display the text returned by the server in the DataClient Text area.

22. Write a Java program to implement client-server communication using Datagram Socket.

23. Write a program to display the address and name of local machine using Factory Methods.

24. Write a java program to implement Cookies using getCookies(), getName() and getValue() methods.

25. Create a server that asks for a password, the opens a file and sends the file over the network connection. Create a client that connects to this server, gives the appropriate password, then captures and saves the file. Test the pair of programs on your machine using the local host (the local loop back IP address 127.0.0.1 produced by calling InetAddress.getByName (null).

Text and Reference Books:

(As given under the Course XII- JAWA PROGRAMMING -17PMACA11)

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SEMESTER -IV

ELECTIVE PAPER– I

CALCULUS OF VARIATIONS AND INTEGRAL EQUATIONS

Paper Code: 17PMACAE01 /17PMA11 **Max. Marks :75** **Credit :04**

Unit I: Variational problems with fixed boundaries:

The concept of variation and its properties – Euler's equation- Variational problems for Functionals – Functionals dependent on higher order derivatives – Functions of several independent variables – Some applications to problems of Mechanics.

(Chapter 1: Sections 1.1 to 1.7 of [1]).

Unit II: Variational Problems with Moving Boundaries:

Movable boundary for a functional dependent on two functions – one-side variations - Reflection and Refraction of extermals - Diffraction of light rays.

(Chapter 2: Sections 2.1 to 2.5 of [1]).

Unit III: Integral Equation:

Introduction – Types of Kernels – Eigen Values and Eigen functions – Connection with differential equation – Solution of an integral equation – Initial value problems – Boundary value problems. (Chapter 1: Section 1.1 to 1.3 and 1.5 to 1.8 of [2]).

Unit IV: Solution of Fredholm Integral Equation:

Second kind with separable kernel – Orthogonality and reality eigen function – Fredholm Integral equation with separable kernel – Solution of Fredholm integral equation by successive substitution – Successive approximation – Volterra Integral equation – Solution by successive substitution. (Chapter 2: Sections 2.1 to 2.3 and Chapter 4 Sections 4.1 to 4.5 of [2]).

Unit V: Hilbert – Schmidt Theory:

Complex Hilbert space – Orthogonal system of functions- Gram Schmit orthogonlization process – Hilbert – Schmit theorems – Solutions of Fredholm integral equation of first kind. (Chapter 3: Section 3.1 to 3.4 and 3.8 to 3.9 of [2]).

Text Books:

[1]. **A.S Gupta**, Calculus of Variations with Application, Prentice Hall of India, New Delhi, 2005. (For Units I and II).

[2]. **Sudir K.Pundir** and **Rimple Pundir**, Integral Equations and Boundary Value Problems, Pragati Prakasam, Meerut, 2005. (For Units III, IV and V).

Books for Reference:

1. F.B. Hildebrand, Methods of Applied Mathematics, Prentice – Hall of India Pvt. New Delhi, 1968.

2. R. P. Kanwal, Linear Integral Equations, Theory and Techniques, Academic Press, New York, 1971.

3. L. Elsgolts, Differential Equations and Calculus of Variations, Mir Publishers, Moscow, 1973.

SEMESTER –IV

ELECTIVE PAPER –II

NUMBER THEORY

Paper Code: 17PMACAE02/17PMAE07 **Max.Marks :75**

Credit :04

Unit I: Divisibility and Congruence:

Divisibility – Primes - Congruence's – Solutions of Congruence's – Congruence's of Degree one. (Chapter 1: Sections 1.1 to 1.3 and Chapter 2: Sections: 2.1 to 2.3).

Unit II: Congruence:

The function $\varphi(n)$ – Congruence of higher degree – Prime power moduli – Prime modulus – Congruence of degree two, prime modulus – power Residues.(Chapter 2: Sections 2.4 to 2.9).

Unit III: Quadratic reciprocity:

Quadratic residues – Quadratic reciprocity – The Jacobi symbol – Greatest Integer function. (Chapter 3: Sections 3.1 to 3.3 and Chapter 4: Section 4.1).

Unit IV: Some Functions of Number Theory:

Arithmetic functions –The Mobius inverse formula – The multiplication of arithmetic functions. (Chapter 4: Sections 4.2 to 4.4).

Unit V: Some Diaphantine Equations:

The equation $ax + by= c$ – positive solutions – Other linear equations – The equation $x^2 + y^2 =z^2$ - The equation $x^4 + y^4 = z^2$ Sums of four and five squares – Waring's problem – Sum of fourth powers – Sum of Two squares. (Chapter 5: Sections 5.1 to 5.10)

Text Book:

1. Niven and H.S Zuckerman, An Introduction to the Theory of Numbers, 3rd edition, Wiley Eastern Ltd., New Delhi, 1989.

Books for Reference:

1. D.M. Burton, Elementary Number Theory, Universal Book Stall, New Delhi 2001.

2. K.Ireland and M.Rosen, A Classical Introduction to Modern Number Theory, Springer Verlag, New York, 1972.

3. T.M Apostol, Introduction to Analytic Number Theory Narosa Publication, House Chennai, 1980.

SEMESTER –IV

ELECTIVE PAPER– III

DATABASE TECHNOLOGY

Paper Code: 17PMACAE03 **Max.Marks :75**

Credit :04

Unit I:

Introduction DBS Application: DBS Vs File System – View of Data – Data models – Database Languages – Database User and Administrators – Transaction Management – DBS Structure – E-R Model: Basic Concepts – Constraints – Keys – Design Issues – E-R Diagram – E-R Features – Design of E-R Database Schema.

Unit II:

Relational Database Design: First Normal Form – Functional Dependencies – Decomposition – Properties of Decomposition – Boyce-Codd Normal Form – Third Normal Form – Fourth Normal Form. Database – Table spaces – Redo Logs – Control files – Programs – Database support processes Memory structure – Oracle instance, Database Objects – Tables – Views – Indexes – Synonyms – Grants – Roles.

Unit III:

SQL – Two types of SQL statements – SQL *Plus: Getting in – Number data type – Character data type – Date data type – Converting from one column type to another – Update, Delete and Alter – Joining two tables together – Formatting the output.

Unit IV:

PL/SQL: Character set – Variables – Common data types – PL/SQL components – Cursors – Compilation errors – Code examples. Snapshots – Functionality. Triggers: Required system and table privileges – Types of triggers – Trigger syntax – combining trigger types –setting inserted values – Maintaining duplicated data – Customizing error conditions – Naming triggers – Enabling and disabling triggers – Replacing triggers – Dropping triggers.

Unit V:

Procedures: Required system and table privileges – Executing procedures – Procedures vs. function – procedures vs. packages – create procedure and function syntax – Remote table reference – Debugging – Customizing error conditions – naming – Create package syntax – Initializing packages – Viewing source code – Compiling, Replacing and Dropping. Oracle Reports: Designer – Object navigator – Setting preferences – Files –Designer components – Sample reports

Text Books:

1. Database System Concepts, 4th Edition, Silberschatz, Korth, Sudarshan. (For Unit I & II).
2. Michael Abbey & Michael J.Corey, Oracle: A beginner's Guide, (TMH).

(For Unit III, IV & V).

Books for Reference:

1. Essential Oracle 7, Tom Leurs, (PHI).
2. Oracle, 2nd Edition – unleashed – Techmedia.

SEMESTER -IV

ELECTIVE PAPER-VI

FLUID DYNAMICS

Paper Code: 17PMACAE04 /17PMA06 **Max. Marks :75**

Credit :04

Unit I: Kinematics of Fluids in Motion:

Real fluids and ideal fluids – Velocity of a fluid at a point stream lines – path lines – Steady and unsteady flows – Velocity potential – The vorticity vector – Local and particle rates of changes – Equations of continuity – Examples. (Chapter 2: Sections 2.1 to 2.8).

Unit II: Equation of Motion of a fluid:

Pressure at a point in a fluid at rest – Pressure at a point in a moving fluid – Condition at a boundary of two invicid immersible fluids. Euler's equation of motion – Discussion of the case of steady motion under conservative body forces. (Chapter 3: Sections 3.1 to 3.7).

Unit III: Some three dimensional flows:

Introduction – Sources – Sinks and doublets – Images in rigid infinite plane – Axis symmetric flows – Stokes stream function. (Chapter 4: Sections 4.1 to 4.3 and 4.5).

Unit IV: Some two-dimensional flows:

Two dimensional flows – Meaning of two dimensional flow – Use of cylindrical polar co-ordinates – The stream function – Complex potential for two dimensional –Irrational incompressible flow – Complex velocity potential for standard two dimensional flows – Examples.
(Chapter 5: Sections 5.1 to 5.6).

Unit V:Viscous flows:

Viscous flows – Stress components in a real fluid – Relation between Cartesian components of stress – Translation motion of fluid elements – The rate of strain quadric and principle stresses – Further properties of the rate of strain quadric – Stress analysis in fluid motion – Relation between stress and rate of strain – The coefficients of viscosity and Laminar flow – The Navier – Stokes equations of motion of a viscous fluid. (Chapter 8: Sections 8.1 to 8.9).

Text Book:

1.F. Chorlton, Text Book of Fluid Dynamic, CBS Publication New Delhi, 1985.

Books for Reference:

1. G.K. Batchaelor, An Introduction to Fluid Mechanics, Foundation Books, New Delhi,1994.

2. S.W. Yuan, Foundations of Fluid Mechanics, Prentice Hall of India Pvt. Ltd., New Delhi, 1976.

3. R.K. Rathy, An Introduction to Fluid Dynamics, IBH Publ. Comp. New Delhi, 1976.

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