SADAKATHULLAH APPA COLLEGE

(AUTONOMOUS)

(Reaccredited by NAAC at an 'A' Grade with a CGPA of 3.40 out of 4.00 in the III cycle An ISO 9001:2008 Certified Institution)

RAHMATH NAGAR, TIRUNELVELI- 11.

Tamilnadu

DEPARTMENT OF MATHEMATICS

(Unaided)

MY LORD
VOUCHSAFE ME WISDOM

CBCS SYLLABUS

For

M.Sc. Mathematics

(Applicable for students admitted in June 2015 and onwards)

(As per the Resolutions of the Academic Council Meeting held on 23.02.2016)

CONTENTS

M.Sc. Mathematics (2015 and onwards)Course Structure (CBCS)

I Semester			II Semester		
Course	**H/W**	**C**	**Course**	**H/W**	**C**
Core 1	6	4	Core 6	6	4
Core 2	6	4	Core 7	6	4
Core 3	6	5	Core 8	6	5
Core 4	6	5	Core 9	6	5
Core 5	6	5	Core Practical	6	3
Total	**30**	**23**	**Total**	**30**	**21**
III Semester			**IV Semester**		
Core 10	6	4	Core 14	6	4
Core 11	6	5	Core 15	6	5
Core 12	6	5	Core 16 - Project	6	5
Core 13	6	5	Core Elective	6	5
Non Major Elective	6	5	Core Elective Practical	6	3
Total	**30**	**24**	**Total**	**30**	**22**

* Examination at the end of semester

Distribution of Hours, Credits, No. of Papers, & Marks

Subject	Hours	Credits	No of papers	Marks
Core + practical	108	77	16 + 1	1800
Major Elective + Practical	12	8	1 + 1	200
Non Major Elective	6	5	1	100
Total	**120**	**90**	**20**	**2000**

DEPT. OF MATHEMATICS (P.G.)								
CBCS SYLLABUS FOR M. Sc. – MATHEMATICS								
SEM	**CO**	**TITLE OF THE PAPER**	**S.CODE**	**H/W**	**C**	**MARKS**		
						I	**E**	**T**
I	C1	Groups, Rings & Fields	15PMAC11	6	4	25	75	100
	C2	Real Analysis - I	15PMAC12	6	4	25	75	100
	C3	Mathematical Statistics	15PMAC13	6	5	25	75	100
	C4	Ordinary and Partial Differential Equations	15PMAC14	6	5	25	75	100
	C5	Classical Mechanics	15PMAC15	6	5	25	75	100
II	C6	Linear Algebra	15PMAC21	6	4	25	75	100
	C7	Real Analysis - II	15PMAC22	6	4	25	75	100
	C8	Calculus of Variations and Integral Equations	15PMAC23	6	5	25	75	100
	C9	Latex and Matlab	15PMAC24	6	5	25	75	100
	CP1	Mathematics (PG) Core Practical	15PMAC2P	6	3	40	60	100
III	C10	Graph Theory	15PMAC31	6	4	25	75	100
	C11	Complex Analysis	15PMAC32	6	5	25	75	100
	C12	Measure Theory and Integration	15PMAC33	6	5	25	75	100
	C13	Operations Research	15PMAC34	6	5	25	75	100
	E (NM)	Choose from the list	-	6	5	25	75	100
IV	C14	Topology	15PMAC41	6	4	25	75	100
	C15	Functional Analysis	15PMAC42	6	5	25	75	100
	C16	Project	15PMAP41	6	5	-	100	100
	E(M)	A) Programming in C++ and Data Structures	15PMAE4A	6	5	25	75	100
		B) Java Programming	15PMAE4B					
	CEP	A) Mathematics (PG) Core Elective Practical-A	15PMAE4PA	6	3	40	60	100
		B) Mathematics (PG) Core Elective Practical-B	15PMAE4PB					
TOTAL				**120**	**90**	**505**	**1495**	**2000**

DEPARTMENT OF MATHEMATICS (PG)

Non-Major Elective Course offered to Other Major PG Students

SEM	P	Title of the paper	S. Code	H/W	C	Marks		
						I	E	T
I	E(NM)	Basics in Mathematics	15PMAN31	6	5	25	75	100
			Total	**6**	**5**	**25**	**75**	**100**

LIST OF NON-MAJOR ELECTIVE COURSES OFFERED TO PG STUDENTS BY VARIOUS DEPARTMENTS

SEM	TITLE OF THE PAPER	S.CODE	H/W	C	MARKS		
					I	E	T
DEPT. OF ENGLISH (PG)							
III	English For Business Communication	15PENN31	6	5	25	75	100
DEPT. OF COMPUTER SCIENCE (PG)							
III	Internet Concepts and Web Design	15PCSN31	6	5	25	75	100
DEPT. OF MATHEMATICS (PG)							
III	Basics in Mathematics	15PMAN31	6	5	25	75	100
DEPT. OF PHYSICS (PG)							
III	Renewable Energy Sources	15PPHN31	6	5	25	75	100

CBCS SYLLABUS FOR M.Sc., MATHEMATICS

I SEMESTER			
Core 1	**GROUPS, RINGS & FIELDS**		**15PMAC11**
Hrs / Week : 6	**Hrs / Sem : 6x 15 = 90**	**Hrs / Unit : 18**	**Credit : 4**

OBJECTIVES:

- To know the richness in the techniques of Mathematics by the way of studying class equation, Sylow‟s theorem, direct products and finite abelian Groups.
- To understand the in-depth concept of Euclidean Rings.
- To know that study of field theory plays a key role in algebra which has impact on the theory of equations.

UNIT I

A Counting Principle - Another Counting Principle - Sylow‟s Theorem (2^{nd} proof only)

UNIT II

Direct Products - Finite Abelian groups.

UNIT III

Euclidean Rings - A Particular Euclidean Ring - Polynomial Rings - Polynomials over the rational fields.

UNIT IV

Extension Fields – The Transcendence of *e* - Roots of Polynomials.

UNIT V

More About Roots – The Elements of Galois Theory (Fundamental Theorem of Galois theory statement only).

TEXT BOOK :

I.N. Herstein - Topics in Algebra (Second Edition) - Wiley India (P.) Ltd, New Delhi.

UNIT-I: Section 2.5, 2.11, 2.12
UNIT-II: Section 2.13, 2.14
UNIT-I: Section 3.7 to 3.10
UNIT-I: Section 5.1 to 5.3.
UNIT-I: Section 5.5, 5.6.

I SEMESTER			
Core 2	**REAL ANALYSIS I**		**15PMAC12**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90**	**Hrs / Unit :18**	**Credit :4**

OBJECTIVES:

- To enable the students to learn enough examples, theorems and techniques in analysis.
- To provide deep understanding of the Metric space concepts.
- To learn more about convergence, continuity and differentiation.

UNIT I

Basic topology: Finite, countable and uncountable sets – Metric spaces – compact sets – Perfect sets – Connected sets.

UNIT II

Numerical sequences and Series: Convergent sequences – Subsequences – Cauchy sequences – Upper and lower limits – Some special sequences.

UNIT III

Series – Series of Nonnegative terms – The number e – The Root and Ratio tests – Power series – Summation by parts – Absolute convergence – Addition and Multiplication of Series – Rearrangements.

UNIT IV

Continuity: Limits of functions – Continuous functions – Continuity and compactness – Continuity and connectedness – Discontinuities – Monotonic Functions – Infinite Limits and Limits at Infinity.

UNIT V

Differentiation: The Derivative of a Real Function – Mean Value Theorems – The Continuity of Derivatives – L‟ Hospital‟s Rule – Derivatives of Higher order – Taylor‟s Theorem – Differentiation of vector-valued functions.

TEXT BOOK:

Walter Rudin –"Principles of Mathematical Analysis" – 3rd Edition, McGraw Hill International Editions.

Unit I : Chapter 2(full)

Unit II : Chapter 3(section 3.1-3.20)

Unit III: Chapter 3(section 3.21-3.55)

Unit IV: Chapter 4(full)

Unit V : Chapter 5(full)

I SEMESTER			
Core 3	**MATHEMATICAL STATISTICS**		**15PMAC13**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90**	**Hrs / Unit : 18**	**Credit : 5**

OBJECTIVES:

- To understand the concept of Probability and Probability Distributions.
- To learn the basic concepts of Mathematical Statistics.
- To know about the theory of sampling.

UNIT I

Conditional Probability and Stochastic Independence: Conditional Probability – Marginal and Conditional distributions – The correlation coefficient –Stochastic Independence

UNIT II

Some Special Distributions: The Binomial, Trinomial and Multinomial distributions –The Poisson distribution –The Gamma distribution & chi-square distribution –The normal distribution–The Bivariate normal distribution.

UNIT III

Distributions of functions of Random variables: Sampling Theory - Transformation of variables of the discrete type – Transformation of variables of the continuous type –The t and F Distributions.

UNIT IV

Extensions of the Change of variable Technique –Distribution of order statistics -The moment generating function technique -Distributions of $\bar{}$ and nS^2/σ^2 - Expectations of functions of random variables.

UNIT V

Limiting Distributions: Limiting Distributions –Stochastic convergence – Limiting moment generating functions –The central limit theorem –Some theorems on Limiting Distributions.

(THEORY : PROBLEMS = 60 : 40)

TEXT BOOK:

1. **Robert V.Hogg and Allen T.Craig**-Introduction to Mathematical Statistics-Pearson Education Asia, Chapters 2, 3, 4 and 5

   Unit I: Chapter 2(section 2.1 to 2.4)

   Unit II: Chapter 3(section 3.1 to 3.5)

   Unit III: Chapter 4(section 4.1 to 4.4)

   Unit IV: Chapter 4(section 4.5 to 4.9)

   Unit V: Chapter 5(section 5.1 to 5.5)

I SEMESTER			
CORE 4	**ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS**		**15PMAC14**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90**	**Hrs / Unit : 18**	**Credit : 5**

OBJECTIVES:

- To discuss several methods for finding power series solutions to differential equations of first order and second order. ++
- To understand the difference between ordinary and regular singular points.
- To learn more about the concepts of first order partial differential equations.

UNIT I

Introduction: A review of power series - Series solutions of first order equations - Second Order Linear equations and Ordinary points

UNIT II

Regular singular points - Regular singular point (continued) - Gauss Hyper Geometric equation - Point at infinity.

UNIT III

Legendre Polynomials- Properties of Legendre Polynomials - Bessel functions. The Gamma Function- Properties of Bessel Functions

UNIT IV

Partial Differential Equations - Origin of First order Partial Differential Equations Cauchy‟s problem for first order equations- Linear equations of the first order – Integral surfaces passing through a given curve – Surfaces orthogonal to a given system of surfaces.

UNIT V

Cauchy‟s method of characteristics - Compatible systems of first order equations - Charpit‟s method - Special type of first order equations- Solution satisfying the given conditions - Jacobi‟s Method

TEXT BOOK :

1. G.F. Simmons- Differential equation with application and historical notes – Tata McGraw Hill Publishing Company Ltd, New Delhi.
   UNIT I: Section 25 to 27
   UNIT II: Section 28 to 31
   UNIT III: Section 32 to 35
2. Ian N. Sneddon – Elements of Partial Differential Equations – Dover Publications, Inc-Mineola, New York.
   UNIT IV: Chapter 2 Section 1 to 6
   UNIT V: Chapter 3 Section 8 to 13

I SEMESTER			
CORE 5	**CLASSICAL MECHANICS**		**11PMAC15**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90**	**Hrs / Unit : 18**	**Credit : 5**

OBJECTIVES:

- To learn more about of the mechanics of a partical, Lagrange‟s equations.
- To study the concepts and advantages of Hamilton‟s principle.
- To learn about Central force problems, Kepler‟s problem.

UNIT I

Survey of the Elementary Principles: Mechanics of a particle - Mechanics of a system of particles – Constraints

UNIT II

D‟Alembert‟s principle and Lagrange‟s Equations - Velocity-dependent potentials and the dissipation functions - Simple applications of the Lagrangian formulation - single particle in space (Cartesian co-ordinates,plane polar co-ordinates)-Atwood‟s machine-bead sliding on rotating wire.

UNIT III

Variational Principles and Lagrange's Equations: Hamilton‟s principle - Some techniques of the calculus of variations - Derivation of Lagrange‟s equations from Hamilton‟s principle - Extension of Hamilton‟s principle to nonholonomic systems - Advantages of a variational principle formulation – Conservation theorems and symmetry properties.

UNIT IV

The Two-Body Central Force Problem: Reduction to the equivalent one-body problem - The equations of motion and first integrals - The equivalent one-dimensional problem, and classification of orbits – The virial theorem – The differential equation for the orbit, and integrable power-law potentials.

UNIT V

Conditions for closed orbits (Bertrand‟s theorem) - The Kepler problem: Inverse Square law of force -The motion in time in the Kepler problem - The Laplace-Runge-Lenz vector-scattering in a central force field.

TEXT BOOK:

Herbert Goldstein- Classical Mechanics-Second Edition-Narosa Publishing House Pvt.Ltd

Unit I: Chapters 1 (1.1 to 1.4)
Unit II: Chapters 1 (1.5 to 1.6)
Unit III: Chapters 2 (2.1 to 2.6)
Unit VI: Chapters 3 (3.1 to 3.5)
Unit V: Chapters 3 (3.6 to 3.10)

II SEMESTER			
Core 6	**LINEAR ALGEBRA**		**15PMAC21**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 =90**	**Hrs / Unit :18**	**Credit : 4**

OBJECTIVES:

- To study the basic concepts of linear dependence, basis, homomorphisms of vector spaces and Inner product spaces.
- To understand an extremely rich structure called algebra of linear transformations and the canonical forms: triangular form, nilpotent transformations.
- To learn about Trace and Transpose, determinants and Transformations.

UNIT I

Elementary Basic Concepts of Vector Spaces - Linear Independence and Bases - Dual Spaces.

UNIT II

Inner Product Spaces - Modules.

UNIT III

The Algebra of Linear Transformations - Characteristic roots - Matrices.

UNIT IV

Canonical Forms: Triangular form - Nilpotent Transformations - Trace and Transpose

UNIT V

Determinants - Hermitian, Unitary and Normal Transformations – Real Quadratic Forms.

TEXT BOOK:

I.N. Herstein - Topics in Algebra (Second Edition) - Wiley India (P.)Ltd, New Delhi

UNIT I: Section 4.1 to 4.3

UNIT II: Section 4.4 to 4.5

UNIT III: Section 6.1 to 6.3

UNIT IV: Section 6.4, 6.5 and 6.8

UNIT V: Section 6.9 to 6.11

II SEMESTER			
Core 7	**REAL ANALYSIS II**		**15PMAC22**
Hrs / Week : 6	**Hrs / Sem : 6x 15 =90**	**Hrs / Unit : 18**	**Credit : 4**

OBJECTIVES:

- To enable the students to learn enough examples, theorems and techniques in analysis.
- To learn about Riemann integration, Sequence and series of functions and Equicontinuous families of functions.
- To impart a deep knowledge in **s**ome special functions and functions of several variables.

UNIT I

The Riemann–Stieltjes Integral: Definition and Existence of the Integral – Properties of the Integral – Integration and differentiation – Integration of Vector-valued functions – Rectifiable Curves.

UNIT II

Sequences and Series of Functions: Discussion of main problem – Uniform convergence – Uniform convergence and continuity – Uniform convergence and Integration.

UNIT III

Uniform convergence and Differentiation - Equicontinuous Families of functions - The stone Weierstrass theorem.

UNIT IV

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.

UNIT V

Functions of Several Variables: Differentiation – The Contraction principle – The Inverse Function Theorem – The Implicit function theorem.

TEXT BOOKS:

Walter Rudin – Principles of Mathematical Analysis, (3rd Edition), Mc Graw Hill International Editions.

UNIT I : Chapter 6 (full)

UNIT II : Chapter 7 (section 7.1 – 7.16)

UNIT III : Chapter 7 (section 7.17 – 7.33)

UNIT IV : Chapter 8 (full)

UNIT V : Chapter 9 (Section 9.10 - 9.29)

II SEMESTER		
Core 8	**CALCULUS OF VARIATIONS AND INTEGRAL EQUATIONS**	**15PMAC23**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 =90 Hrs / Unit :18**	**Credit : 5**

OBJECTIVES:

- To study the basic concepts of maxima and minima in Calculus of Variations with its applications.
- To understand the relation between differential and integral equations and to study the concept of Green‟s function.
- To learn about Fredholm equations and Hilbert Schmidt theory.

UNIT I

Calculus of Variations and Applications: Maxima and minima - The simplest case -Illustrative examples - Natural boundary conditions and transition conditions - The variational notation - The more general case.

UNIT II

Constraints and Lagrange multipliers - Variable end points - Sturm-Liouville problems - Hamilton‟s principle - Lagrange‟s equations.

UNIT III

Integral Equations: Introduction - Relation between differential and integral equations - The Green‟s function - Alternative definition of the Green‟s function.

UNIT IV

Linear equations in cause and effect. The influence function - Fredholm equations with separable kernels - Illustrative example.

UNIT V

Hilbert-Schmidt theory- Iterative methods for solving equations of the second kind - The Neumann Series - Fredholm theory

TEXT BOOK :

Francis B. Hildebrand, Methods of Applied Mathematics**,** Second Edition, Prentice Hall, INC. Englewood Cliffs, New Jersey

UNIT I: Section 2.1 to 2.6

UNIT II: Section 2.7 to 2.11

UNIT III: Section 3.1 to 3.4

UNIT IV: Section 3.5 to 3.7

UNIT V: Section 3.8 to 3.11

II SEMESTER		
CORE 9	**LATEX AND MATLAB**	**15PMAC24**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90 Hrs / Unit : 18**	**Credit : 5**

OBJECTIVES

- To learn the latest techniques in Latex for the preparation of printable document in an enhanced manner.
- To avoid difficulty while typing project or thesis comparing other mathematical software.
- To solve mathematical equations and to draw graphs using MATLAB.

UNIT – I

Introduction - Basics of Latex - **Text, Symbols and Commands:** 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 - **Displayed Text:** Changing font – Centering and indenting – Lists – Generalized lists - Printing literal text – **Text in Boxes:** Boxes - Footnotes and marginal notes.

UNIT – II

Tables: Tubular stops – Tables - **Mathematical Formulas**: Mathematical Environment – Main elements of math mode – Mathematical symbols - Additional Elements - Fine tuning mathematics - **Drawing with Latex:** The picture environment – Extended pictures.

UNIT - III

Introduction - Basics of MATLAB - Matrices and Vectors - Matrix and array operations.

UNIT IV

Interactive computation: Character strings – A special note on array operation – Command Line Function - Using built in functions and Online help – Saving and Loading data - Plotting simple graphs.

UNIT V

Application: Linear Algebra – Curve Fitting and Interpolation – Data Analysis and Statistics – Numerical Integration – **Ordinary Differential Equation:** A first order linear ODE and A second order non-linear ODE.

TEXT BOOKS:

1. Guide to LATEX by Helmut Kopka and Patrick W. Daly, Fourth Edition, Addison –Wesley, Pearson Education, 2004.
   UNIT I: Chapter 1: Sections: 1.5, 2.1 – 2.6, 3.1 – 3.4, 4.1 – 4.6, 5.1-5.2
   UNIT II: Chapter 2: Sections: 6.1 – 6.2, 7.1 – 7.5, 16.1 –16.2.
2. Getting Started with MATLAB – A quick introduction for Scientist and Engineers by Rudra Pratap, Oxford University Press 2003.

UNIT III: Chapter 3: Sections: 1.1, 1.6, 3.1, 3.2
UNIT IV: Chapter 4: Sections: 3.3 – 3.8.
UNIT V: Chapter 5: Sections: 5.1 – 5.4, 5.5 (5.5.1, 5.5.2 only).

II SEMESTER			
CP 1	MATHEMATICS(PG) CORE PRACTICAL		15PMAC2P
Hrs / Week : 6	Hrs / Sem : 6 x 15 = 90	Hrs / Unit : 18	Credit : 3

LATEX PRACTICAL

1. Write a LaTeX coding for Basic Mathematical Equation.
2. Write a LaTeX coding for Mathematical Equation with Mathematics Formulae.
3. Write a LaTeX coding for Mathematical Equation with Delimiters.
4. Write a LaTeX coding for prepare a paper for Journal.
5. Write a LaTeX coding for Beemer presentation.
6. Write a LaTeX coding for Time Table.
7. Write a LaTeX coding for Class Schedule Time Table.
8. Write a LaTeX coding for Nature Scene.
9. Write a LaTeX coding for Rangoli.
10. Write a LaTex coding for Draw a Lotus.
11. Write a LaTeX coding for Construct a Home.
12. Write a LaTeX coding for Chess Board.
13. Write a LaTeX coding for draw Tamil letters.
14. Write a LaTeX coding for draw your name in Tamil letters.
15. Write a LaTeX coding for Color Letters.
16. Write a LaTeX coding for Draw different types of Boxes.

MATLAB PRACTICAL

1. To draw a line using MATLAB coding.
2. To draw a curve using MATLAB coding.
3. To find the addition, subtraction and multiplication of any two matrix using MATLAB coding.
4. To find the determinant, inverse and eigen value of given matrix using MATLAB coding.
5. To find the solution of any differential equation using MATLAB coding.
6. To solve the partial fraction using MATLAB coding.
7. To solve a linear system of three equations using MATLAB coding.
8. How to delete a row and column of a Matrix using MATLAB coding.
9. Create a simple inline function and compute its value using MATLAB coding.
10. To find the roots of the polynomial using MATLAB coding.

III SEMESTER			
Core 10	**GRAPH THEORY**		**15PMAC31**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90**	**Hrs / Unit : 18**	**Credit : 4**

OBJECTIVES:

- To provide an indepth knowledge of graph theoretical concepts.
- To motivate the students to do research in discrete and applied mathematics.
- To learn about coloring and Ramsey numbers.

UNIT I

Trees: Bridges - Trees. Connectivity: Cut vertices - Blocks – Connectivity.

UNIT II

Traversability: Eulerian graphs–Hamiltonian graphs. Digraphs: Strong Digraphs.

UNIT III

Matchings and Factorizations: Matchings – Factorization – Decompositions and Graceful Labelings.

UNIT IV

Planarity: Planar graphs –Embedding Graphs on surfaces. Coloring: Vertex coloring.

UNIT V

Edge coloring –The Heawood Map coloring theorem. Ramsey Numbers: The Ramsey number of graphs. Distance: The centre of a graph.

TEXT BOOK:

Gary Chartrand and Ping Zhang - Introduction to Graph Theory, Edition 2006. Tata McGraw-Hill Publishing Company Limited, New Delhi.

UNIT I: Chapter 4(4.1, 4.2), Chapter 5(5.1, 5.2, 5.3).

UNIT II: Chapter 6(6.1, 6.2), Chapter 7(7.1).

UNIT III: Chapter 8(8.1, 8.2, 8.3)

UNIT IV: Chapter 9(9.1, 9.2), Chapter 10 (10.2).

UNITV: Chapter 10 (10.3, 10.4), Chapter 11(11.1), Chapter 12 (12.1).

III SEMESTER			
Core 11	**COMPLEX ANALYSIS**		**15PMAC32**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90**	**Hrs / Unit : 18**	**Credit : 5**

OBJECTIVES:

- To learn the basic concepts of analytic functions and power series.
- To understand the concepts of Complex Integration using and Cauchy‟s integral formula and Residue theorem
- To acquire the knowledge of Harmonic functions.

UNIT I

Complex Functions: Introduction to the Concept of Analytic Function - Elementary Theory of Power Series

UNIT II

Conformality: Arcs and closed curves - Analytic functions in Regions - Conformal Mapping - Length and Area. **Linear Transformations:** The Linear Group - The cross ratio - Symmetry.

UNIT III

Complex Integration: Fundamental Theorems - Cauchy‟s Integral Formula.

UNIT IV

Local Properties of Analytical Functions: Removable Singularities and Taylor‟s Theorem – Zeros and Poles - The Local Mapping - **The Calculus of Residues**.

UNIT V

Harmonic Functions: Definition and Basic Properties – The Mean-value Property – Poisson‟s Formula – Schwarz‟s Theorem - **Power Series expansions**.

TEXT BOOKS:

Lars V. Ahlfors - Complex Analysis - Third Edition - McGraw- Hill International Company, Singapore.

UNIT I: Chapter 2 (1.1 to 1.4 and 2.1 to 2.5)
UNIT II: Chapter 3 (2.1 to 2.4 and 3.1 to 3.3)
UNIT III: Chapter 4 (1.1 to 1.5 and 2.1 to 2.3)
UNIT IV: Chapter 4 (3.1 to 3.3 and 5.1 to 5.3)
UNIT V: Chapter 4 (6.1 to 6.4) Chapter 6 (1.1 to 1.3)

III SEMESTER			
Core 12	**MEASURE THEORY AND INTEGRATION**		**15PMAC 33**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90**	**Hrs / Unit : 18**	**Credit : 5**

OBJECTIVES:

- To Introduce the Lebesgue Measure and Lebesgue Integrals, Measure and Integration.
- To understand the concept of measurable functions & some basic theorems on measurable functions
- To learn about measure spaces, signed measures and product measures.

UNIT I

Lebesgue Measure: Introduction - Outer Measure - Measurable Sets and Lebesgue Measure –A non Measurable set - Measurable Functions - LittleWood‟s three principles.

UNIT II

The Lebesgue Integral: Riemann Integral - The Lebesgue Integral of a bounded function over a set of finite measure - The Integral of a non negative function - The general Lebesgue Integral - Convergence in Measure.

UNIT III

Differentiation and Integration: Differentiation of monotone functions - Functions of bounded variation - Differentiation of an integral - Absolute continuity.

UNIT IV

Measure and Integration: Measure Spaces - Measurable functions-Integration - General convergence Theorems - Signed Measures - The Radon Nikodym Theorem.

UNIT V

Measure and Outer Measure: Outer Measure and Measurability - The Extension Theorem - Product Measures - Integral Operators.

TEXT BOOKS:

H.L.Royden - Real Analysis, Dorling Kindersley (India) Pvt. Ltd - Third Edition, Pearson Education.

Unit I: Chapter 3 (1 to 6)
Unit II: Chapter 4 (1 to 5)
Unit III: Chapter 5 (1 to 4)
Unit IV: Chapter 11 (1 to 6)
Unit V: Chapter 12 (1, 2, 4 and 5)

III SEMESTER		
Core 13	**OPERATIONS RESEARCH**	**15PMAC34**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90 Hrs / Unit : 15**	**Credit : 5**

OBJECTIVES:

- To understand the concept of dynamic programming, game theory and decision theory.
- To learn about inventory models.
- To understand the concept of queueing theory.

UNIT I

Decision Theory and Games.

UNIT II

Dynamic Multistage Programming

UNIT III

Inventory Models: The ABC inventory system – A generalized inventory model – deterministic models.

UNIT IV

Inventory Models: Probabilistic Models

UNIT V

Queuing theory: Basic elements of a queueing model – Roles of the Poisson and Exponential Distributions – Queues with combined arrival and departures.

Theory: Problem = 60: 40

TEXT BOOK:

HAMDY A. TAHA, Operations Research An Introduction, Fourth Edition, MacMillan Publishing Company, Newyork.

REFERENCE BOOK:

Kanti Swarup, P.K. Gupta and Man Mohan, Operation Research, Eleventh Edition, Sultan Chand & Sons, New Delhi.

UNIT I: Chapter 11
UNIT II: Chapter 9
UNIT III: Chapter 13 (13.1 – 13.3)
UNIT IV: Chapter 13 (13.4)
UNIT V: Chapter 15 (15.1, 15.2, 15.3 (15.3.7 upto))

IV SEMESTER			
Core 14	**TOPOLOGY**		**15PMAC41**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90**	**Hrs / Unit : 18**	**Credit : 4**

OBJECTIVES:

- To introduce basic concepts of Topology.
- To introduce product Topology and quotient Topology.
- To study the countability axioms and Urysohn metrization theorem.

UNIT I

Topological spaces – Basis for a Topology – Order Topology – The product Topology on $X \times Y$ – The Subspace Topology – Closed sets and Limit points.

UNIT II

Continuous functions – The Product Topology - The Quotient Topology.

UNIT III

Connected spaces, components and local connectedness - compact spaces.

UNIT IV

Local compactness - The Countability axioms - The Separation axioms.

UNIT V

Normal Spaces – Urysohn lemma - Urysohn metrization theorem.

TEXT BOOKS: J.R. Munkres – Topology-2nd Edition, Eastern Economy Edition – Prentice- Hall of India Pvt Ltd, New Delhi.

UNIT I: Chapter 2 (12 to 17).
UNIT II: Chapter 2(18, 19, 22).
UNIT III: Chapter 3 (23, 25, 26).
UNIT IV: Chapter 3 (29), Chapter 4 (30, 31).
UNIT V: Chapter 4 (32, 33, 34)

IV SEMESTER			
Core 15	**FUNCTIONAL ANALYSIS**		**15PMAC42**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90**	**Hrs / Unit : 18**	**Credit : 5**

OBJECTIVES:

- To introduce the study of Banach spaces and its applications.
- To introduce the concept of Hilbert spaces, conjugate spaces, adjoint, self adjoint, normal and unitary operators.
- To introduce finite dimensional spectral theory.

UNIT I

Banach Spaces: The definition and some examples - Continuous linear transformations -The Hahn-Banach theorem.

UNIT II

The natural imbedding of N in N** - The open mapping theorem - The conjugate of an operator.

UNIT III

Hilbert spaces: The definition and some properties - Orthogonal complements -Orthonormal sets - The conjugate space H*.

UNIT IV

The adjoint of an operator – Self-adjoint operator - Normal and Unitary operators -Projections.

UNIT V

Finite-Dimensional Spectral Theory: Matrices - Determinants and the spectrum of an operator – The spectral theorem.

TEXT BOOK:

George F.Simmons – Introduction to Topology and Modern Analysis, Tata McGraw-Hill Publishing Company Ltd, New Delhi.

UNIT I: Chapter 9 (46 to 48)
UNIT II: Chapter 9 (49 to 51)
UNIT III: Chapter 10 (52 to 55)
UNIT IV: Chapter 10 (56 to 59)
UNIT V: Chapter 11 (60 to 62)

IV SEMESTER		
Core 16	**PROJECT**	**15PMAP41**
Hrs / Week : 5	**Hrs / Sem : 7 x 15 = 75**	**Credit : 5**

Objective:

Every PG student is required to prepare the project subject related - based on the guidelines of his / her project guide.

The following are the guidelines to be adhered to

- The project should be an individual one
- The language for the project is **English**
- The Minimum number of pages should be **60**
- Project observations, suggestions and conclusion shall form part of the project.
- **The Projects will be evaluated both by the Internal as well as External Examiner each for 100 marks. The distribution of mark should be** 60 marks for the Project Report and 40 marks for the Viva-voce Examination**. The Division of marks for the Project Report is as mentioned below:**

Particulars	Internal Examiner	External Examiner
Wording of Title	5	5
Objectives/ Formulation including Hypothesis	5	5
Review of Literature	10	10
Relevance of Project to Social Needs	5	5
Methodology/ Technique/ Procedure Adopted	20	20
Summary/ Findings/ Conclusion	5	5
Bibliography/ Annexure/ Foot notes	10	10
Total	**60**	**60**

The average mark of Internal and External Examiner is considered as marks of project report.

IV SEMESTER		
Core Elective(A)	**Programming in C++ and Data Structures**	**15PMAE4A**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90 Hrs / Unit : 18**	**Credit : 5**

OBJECTIVES:

- To study the C++ language as it plays an important role in the software area.
- To enable the students to face this competitive world by learning the various techniques in developing a program.
- To understand data structure- stacks, queues and graphs.

UNIT I

Control Structures – Functions in C++ – Classes and objects.

UNIT II

Operator Overloading and Type Conversion – Inheritance: Extending Classes.

UNIT III

Pointers, Virtual functions and polymorphism - Managing Console I/O operations.

UNIT IV

Stacks and Queues - Singly Linked list - Linked stacks and Queues – Polynomial Addition.

UNIT V

Graphs – Internal Sorting.

TEXT BOOK

1. E. Balagurusamy- Object oriented programming in C++, 4th Edition, Tata Mc Graw – Hill publishing company Limited.

2. Ellis Horowitz & Sartaj Sahni – Fundamental‟s of Data Structures, Galgotia books source, Gurgaon.

UNIT I: (Text Book1)Chap3(section-3.24),Chap 4(section-4.1 – 4.11), Chap5 (section-5.1 – 5.16) **UNIT II**:(TB1) Chapter 7(sec7.1 – 7.8),Chapter 8(sec-8.1 – 8.12)

UNIT III: (TB1) Chapter 9(sec-9.1 – 9.7), Chapter 10 (sec-10.1 – 10.6)

UNIT IV: (TB2) Chapter 3 (sec3.1 – 3.4), Chapter 4 (sec 4.1,4.2,4.4)

UNIT V: (TB2) Chapter 6 (6.1 - 6.5), Chapter 7 (7.1 - 7.6)

IV SEMESTER			
Core Elective (B)	**JAVA PROGRAMMING**		**15PMAE4B**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90**	**Hrs / Unit : 18**	**Credit : 5**

OBJECTIVES:

- To have a knowledge of JAVA Language.
- To study Classes, Objects and Methods.
- To study how to develop algorithms and to provide a deep understanding in the field of computer programming.

UNIT I

An Overview of Java Language: Object oriented programming–A first simple program–A second short program–Two control statements –Using blocks of code –Lexical issues–The java class libraries.

Data types, variables & Arrays: The primitive types–Integers–Floating-point types –Characters–Booleans–A closer look at Literals –Variables –Type conversion and casting–Arrays.

Operators: Arithmetic Operators–The Bitwise Operators–Relational Operators –Boolean Logical Operators–The Assignment Operator–The ? Operator–Operator precedence –Using parentheses.

UNIT II

Control statements: Java‟s selection statements–Iteration statements–Jump statements.

Introducing Classes: Class fundamentals – Declaring objects – Assigning object Reference Variables – Introducing methods – Constructors – The this keyword – Garbage collection – The finalize( ) method.

A closer look at methods & classes: Over loading methods – using objects as parameters – A closer look at argument passing – returning objects – Recursion – Introducing Access control – Understanding static – Introducing final – Introducing Nested & inner classes – Exploring the string class – using command- line arguments.

UNIT III

Inheritance: Inheritance Basics – using super – creating a multilevel hierarchy – when constructors are called – method overriding – Dynamic method dispatch – using abstract classes – using final with inheritance – The object class.

Packages and Interfaces: Packages - Access protection – importing packages – Interfaces.

UNIT IV

Exception handling: Exception handling fundamentals – Exception types – Uncaught Exceptions – Using try and catch- Multiple catch clauses – Nested try statements – throw – throws – finally – Java‟s built-in Exceptions – creating your own Exception subclasses – chained exceptions – using exceptions.

Multithreaded Programming: The java thread model – The main thread – Creating a thread – creating multiple threads – using isAlive() and join() – thread priorities – synchronization – interthread communication – suspending,resuming and stopping threads – using multithreading.

UNIT V

The Applet class: Two types of Applets – Applet basics – Applet architecture – An Applet skeleton – simple Applet display methods – requesting repainting – using the status window – The HTML Applet tag – passing parameters to Applets.

Introducing the AWT: Working with windows,graphics & Text: AWT classes – window fundamentals – working with frame windows – creating a frame window in an Applet – creating a windowed program – displaying information within a window – working with graphics – working with color – setting the paint mode – working with fonts – managing text output using font metrics – centering text – multiline text alignment.

TEXT BOOKS:

1. **Herbert Schildt**-JAVA – 2, The complete reference (7^{th} edition), Tata McGraw Hill 2001.
   Unit I: Chapter 2(1 to 7),3(1 to 9,11),4(full)
   Unit II: Chapter 5(full),6(1 to 8),7(1 to 8,10,11,12)
   Unit III: Chapter 8(full),9(full)
   Unit IV: Chapter 10(full),11(full)
   Unit V: Chapter 21(1 to 9),23(full)

IV SEMESTER		
CEP(A)	**MATHEMATICS (PG)** **CORE ELECTIVE PRACTICAL-A**	**15PEM4PA**
Hrs/Week : 6	**Hrs / Sem : 6 x 15 = 90**	**Credit : 3**

PROGRAMMING IN C++ PRACTICAL

1. Write a Program to evaluate the following investment equation

$V = P (1 + r)^n$ and print the tables which would give the value of V for various combination
of the following values of P, r, and n:
P : 1000, 2000, 3000, ..., 10,000
r : 0.10, 0.11, 0.12, ...0.20
n : 1, 2, 3,..... , 10
(Hint : P is the principal amount and V is the value of money at the end of n years. This equation can be recursively written as
V = P (1 + r)
P = V
In other words, the value of money at the end of the first year becomes the principal amount for the next year, and so on.

2. An election is contested by five candidates. The candidates are number 1 to 5 and the voting is done by marking the candidate number on the ballot paper. Write a program to read the ballots and count the votes cast for each candidates using an array variable count. In case, a number read is outside the range 1 to 5, the ballot should be considered as a „spoilt ballot", and the program should also count the number of spoilt ballots.

3. Write programs to evaluate the following functions to 0.0001% accuracy.

a) $\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} + \frac{x^7}{7!} + ...$

b) SUM = $1 + |(1/2)^2 + (1/3)^3 + (1/4)^4 + ...$

c) $\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} + \frac{x^6}{6!} + ...$

4. An electricity board charges the following rates to domestic users to discourage large consumption of energy :

For the first 100 units - 60 P per unit
For next 200 units - 80 P per unit
Beyond 300 units - 90 P per unit

All users are charged a minimum of Rs. 50.00. If the total amount is more than Rs. 300.00 then an additional surcharge of 15% is added.

Write a program to read the names of users and number of units consumed and print out the charges with names.

5. Write a function *power ( )* to raise a number *m* to a power *n*. The function takes a *double* value for *m* and int value for n and returns the result correctly. Use a default value to 2 for n to make the function to calculate squares when this argument is omitted. Write a main that gets the values of m and n from the user to test the function.

6. Define a class to represent a bank account. Include the following members.

Data members

1. Name of the depositor
2. Account number
3. Type of account
4. Balance amount in the account

Member functions

1. To assign initial values
2. To deposit an amount
3. To withdraw an amount after checking the balance
4. To display name and balance

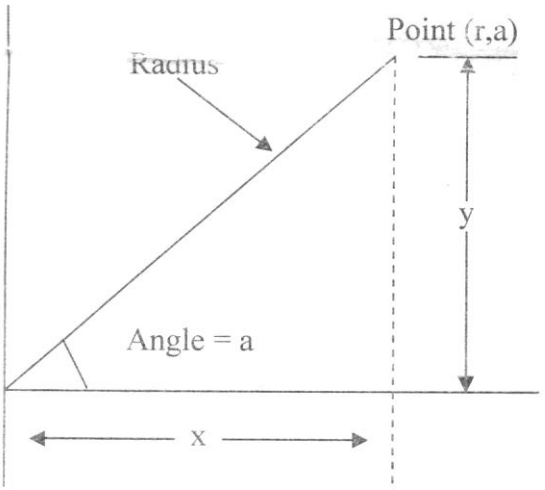
Write a main program to test the program.

7. Write a class to represent a vector (a series of float values). Include member functions to perform the following tasks:

a. To create the vector
b. To modify the value of a given element
c. To multiply by a scalar value
d. To display the vector in the form (10, 20, 30.....)

Write a program to test your class.

8. Design a class Polar which describes a point in the plane using polar coordinates radius and angle. A point in polar coordinates is shown below.



Polar coordinates of a point
Use the overloaded + operated to add two objects of polar
Note that we cannot add polar values to two points directly. This requires first the conversion of points into rectangular co-ordinates, then adding the corresponding rectangular co-ordinates and finally converting the result back into polar co-ordinates. You need to use the following trigonometric formulae;

```
x = r* cos (a)
y = r* sin (a)
a = atan (x/y);                    // arc tangent
r = sqrt (x*x + y*y);
```

9. Assume that a bank maintains two kids of accounts for customers, one called as savings account and the other as current account. The savings account provides compound interest and withdrawal facilities but no cheque book facility. The current account provides cheque book facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below this level, a service charge is imposed.

10. Create a class account that scores customer name, account number and type of account. From this derive the classes cur_acct and sav_acct to make them more specific to their requirements. Include necessary member functions in order to achieve the following tasks:

   a. Accept a deposit from a customer and update the balance
   b. display the balance
   c. compute and deposit interest
   d. permit withdrawal and update the balance.
   e. check for the minimum balance, impose penalty, necessary and update the balance.

Do not use any constructors. Use member functions to initialize the class members.

11. Create a base class called shape. Use this class to store two double type, values that could be used to compute the area of figures. Derive two specific classes called

triangle and rectangle from the base shape. Add to the base class, a member function get_data ( ) to initialize base class data members and another member function display_area ( ) to compute and display the area of figures. Make display_area ( ) as a virtual function and redefine this function in the derived classes to suit their requirements.

Using these three classes, design a program that will accept dimensions of a triangle or a rectangle interactively, and display the area.
Remember the two values given as input will be treated as lengths of two sides in the case of rectangles, and as base and height in the case of triangles, and used as follows :

Area of rectangle = x * y
Area of triangle = ½ * x* y

12. Write a program to read a list containing item name, item code, and cost interactively and produce a three column output as shown below.

Name	Code	Cost
Turbo C++	1001	250.95
C Primer	905	95.70
……	……	……...

Note that the name and code are left justified and the cost is right justified with a precision of two digits. Trailing zeros are shown.

DATA STRUCTURE PRACTICAL

1. Implement Stack Operation a) PUSH b) POP
2. Implementation of basic queue operation a) ADD b) DELETE
3. Addition and deletion of a node in a linked list
4. Minimum spanning tree
5. Shortest path algorithm
6. Quick sort
7. Merge sort
8. Polynomial addition using linked list (Using C++)

IV SEMESTER		
CEP (B)	**MATHEMATICS (PG)**	
	CORE ELECTIVE PRACTICAL-A	**15PEMA4PB**
Hrs/Week : 6	**Hrs / Sem : 6 x 15 = 90**	**Credit : 3**

JAVA PROGRAMMING PRACTICAL

1. Write a JAVA program using simple arithmetic calculation.
2. Write a JAVA program using one dimensional array.
3. Write a JAVA program using classes and objects.
4. Write a JAVA program using overloading.
5. Write a JAVA program using overriding and inheritance
6. Write a JAVA program for payroll using interface
7. Write a JAVA program for matrix addition & multiplication.
8. Write a JAVA program to find NCR value using Recursion.
9. Write a JAVA program to find the volume of sphere & cone
10. Write a JAVA program to check the given number is perfect or not.
11. Write a JAVA program to check the given number is Armstrong or not.
12. Write a JAVA program to solve the quadratic equation.
13. Write a JAVA program to find the factorial of a number.
14. Write a JAVA program to find the simple interest.
15. Write a JAVA program to display calendar details.
16. Write a JAVA program using package.
17. Write a JAVA program using Runge-kutta2 method.
18. Write a JAVA program using Runge-kutta4 method.
19. Write a JAVA program to input a year and check whether the year is a leap year or not.
20. Write a JAVA program to reverse the number.
21. Write a JAVA program to find the area and perimeter of triangle, circle.
22. Write a JAVA program to draw lines, rectangles and ovals in Applet.
23. Write a JAVA program to implement smiley face using Applet.
24. Write a JAVA program to create animation using Applet.
25. Write a JAVA program to create a frame window in Applet.

III SEMESTER		
Non Major Elective	**BASICS IN MATHEMATICS**	**15PMAN31**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90 Hrs / Unit : 18**	**Credit : 5**

OBJECTIVES:

- To introduce the basic concepts in mathematics.
- To understand the basics needed for competitive examinations.
- To learn about the data interpretations.

UNIT I

Average – Surds and indices - percentage.

UNIT II

Profit and loss – Ratio and proportion – partnership.

UNIT III

Chain rule – Time and work – Time and distance.

UNIT IV

Area – Volume and surface areas.

UNIT V

Calendar –Permutations and combinations – odd man out & series.

TEXT BOOKS:

R.S. AGGARWAL-Quantitative Aptitude for competitive examinations-S.Chand & company LTD.

Unit I: Chapter 6,9,10
Unit II: Chapter 11,12,13
Unit III: Chapter 14,15,17
Unit IV: Chapter 24,25
Unit V: Chapter 27,30,35

SCHEME OF EXAMINATIONS UNDER CBCS (2015 - 2018)

The medium of instruction in all UG and PG courses is English and students shall write the CIA Tests and Semester Examinations in English. However, if the examinations were written in Tamil, the answer papers will be valued.

POSTGRADUATE COURSES

SUBJECT	TOTAL MARKS	CIA TEST	SEMESTER EXAMINATION	PASSING MINIMUM		
				CIA EXAM.	SEM. EXAM.	OVER ALL
Theory	100	25	75	nil	38	50
Practical	100	40	60	nil	30	50
Project	100	nil	Report - 60 marks Viva Voce - 40 marks	nil	50	50

DIVISION OF MARKS FOR CIA TEST

SUBJECT	MARKS	ASSIGNMENT FOR UG / ASSIGNMENT OR SEMINAR FOR PG	REGULARITY	RECORD NOTE	TOTAL MARKS
Theory	20	5	--	--	**25**
Practical	30	--	5	5	**40**

1. The duration of each CIA Test is ONE hour and the Semester Examination is THREE hours.
2. Three CIA tests of 20 marks each will be conducted and the average marks of the best two tests out of the three tests will be taken.
3. The I test will be based on the first 1.5 units of the syllabus, the II test will be based on the next 1.5 units of the syllabus and the III test will be based on the next 1.5 units of the syllabus.
4. Two assignments for Undergraduate, Certificate, Diploma and Advanced Diploma Courses and two assignments OR two seminars for Postgraduate Courses.
5. The duration and the pattern of question paper for practical examination may be decided by the respective Boards of Studies. However, out of 60 marks in the semester practical examination, 10 marks may be allotted for record and 50 marks for practical.
6. Three internal practical tests of 25 marks each will be conducted for science students in the even semester and the best two out of the three will be taken. The total 50 marks of the best two tests will be converted to 30 by using the following formula:

$$\left(\begin{array}{c}\text{Marks secured in the first best Practical Test (Out of 25)}\\ + \\ \text{Marks secured in the next best Practical Test (out of 25)}\end{array}\right) \text{X } 0.6$$

7. The Heads of Science Departments are requested to keep a record of attendance of practicals for students to assign marks for regularity.

QUESTION PAPER PATTERN FOR CIA TEST (THEORY)

Duration: 1 Hr **Maximum Marks: 20**

Section	Question Type	No. of Questions & Marks	Marks
A	No Choice Answer should not exceed 75 words	2 Questions 2 marks each	2 x 2 = 4
B	Internal choice (Either or type) Answer should not exceed 200 words	2 Questions 4 marks each	2 x 4 = 8
C	Open Choice (Answer ANY ONE out of Two) Answer should not exceed 400 words	1 Question 8 marks	1 x 8 = 8
		TOTAL	**20 MARKS**

QUESTION PAPER PATTERN FOR SEMESTER EXAMINATION (THEORY)

Duration: 3 Hrs **Maximum Marks: 75**

Section	Question Type	No. of Questions & Marks	Marks
A	No Choice Answer should not exceed 75 words	10 Questions - 2 marks each (2 Questions from each unit)	10 x 2 = 20
B	Internal choice (Either or type) Answer should not exceed 200 words	5 Questions with internal choice. Each carries 5 marks (Two questions from each unit)	5 x 5 = 25
C	Open Choice (Answer ANY THREE out of FIVE) Answer should not exceed 400 words	3 Questions out of 5 - 10 marks each (1 Question from each unit)	3 x 10 = 30
		TOTAL	**75 MARKS**