



**DEPARTMENT OF MATHEMATICS**

**EMPLOYABILITY**

**ENTERPRENEURSHIP**

**SKILL  
DEVELOPMENT**

**CC- II PROGRAMMING IN C**

**Theory Hours : 3 Course Code : U21MC102**

**Practical Hours : - Credits : 2**

**Exam Hours : 3 Internal : 25**

**External : 75**

**UNIT - I**

**Introduction to C – History – Identifiers – Keywords – Variables – Data types – Operators and Expressions – Input and Output statements.**

**UNIT - II**

Conditional statements: simple if, if-else, nested if else, else if ladder, switch and go to statement – Looping statements: while, do-while and for statements – Nesting of loops.

**UNIT - III**

**Introduction to Arrays – One dimensional – Two dimensional.**

**UNIT - IV**

Introduction to Modular Programming: Functions – Call by Value – Call by reference Category of functions – Nesting of functions.

**UNIT - V**

**Introduction to structures and unions – Array of structures – Array within structures, Structures within Structures.**

**TEXT BOOK :**

[1] Balagurusamy. E, Programming in ANSI C, Tata McGraw – Hill, Third Edition, 2013.


**UNIT I :** Sections 1.1 - 1.10, 2.2 – 2.14, 3.2, 3.16, 4.1 - 4.5.

**UNIT II :** Sections 5.1 - 5.9, 6.1 - 6.5.

**UNIT III :** Sections 7.1 - 7.4.

**UNIT IV :** Sections 9.1 - 9.12.



  
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**UNIT V** : Sections 10.1 - 10.8.

## REFERENCE (S):

- [1]D.M. Ritchie, The C Programming Language, Prentice Hall of India, 1977. [2] Y. Kanetkar, Understanding Pointers in C, 4<sup>th</sup> Edition, BPB publications, New Delhi. [3]C. Gottfried, Programming in C, Schaum outline series, 1996.  
[4]P. Pandiyaraja, Programming in C, Vijay Nicole Imprint Private Limited, 2005.

## Question Paper Pattern

**SECTION A** :  $20 \times 1 = 20$  (Each Unit Carries Four Multiple Choice Questions )

**SECTION B** :  $5 \times 5 = 25$  (Each Unit Carries Two Questions (Either or Type ))

**SECTION C** :  $3 \times 5 = 30$  (Each Unit Carries One Questions )

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**Total** = 75

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## NMEC – I MATHEMATICS FOR COMPETITIVE EXAMINATIONS - I

**Theory Hours : 2 Course Code :U21M3NME1:2**

**Practical Hours : - Credits : 2**

**Exam Hours : 3 Internal : 25**

**External : 75**

## UNIT - I

Numbers – HCF and LCM – Decimal Fractions.

## UNIT - II

Square Roots and Cube Roots – Percentage – Average – Ratio and Proportion – Partnership – Profit and Loss.

## UNIT - III



  
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**Time and Work – Time and Distance.**

## UNIT - IV

Problems on Trains – Problems on Numbers – Problems on Ages.

## UNIT - V

**Area – Volume and Surface Areas.**

### TEXT BOOK:

[1]. R.S Aggarwal, Quantitative Aptitude , S.Chand and company Ltd., New Delhi,2008.

### REFERENCE(S) :

[1]. B.S.Sijwali, quantitative aptitude Arihant Publications(india) Pvt Ltd 2007. [2].

Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Mc Graw Hill Companies, 2006.

[3]. Arora .P.N. and Arora.s. 2009, Quantitative Aptitude Mathematics: Volume 1,S.Chand and company Ltd.

[4]. Kothari. C.R.1989, Quantitative techniques,Vikas Publishing House Pvt Ltd. [5].

Srinivasan.T.M., Perumalswami.S. and gopala Krishnan.M.D., 1985 , Elements of Quantitative Techniques, Emerald Publishers.

### Question Paper Pattern


Each units fifteen multiple choice questions for all topics:  $75 \times 1 = 75$

### SEC – I Introduction to Latex (for Scientific Documentation)

Theory Hours : 2 Course Code : P21M1SE1P

Exam Hours : 2 Credits : 2 Internal : 40 External : 60



  
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## UNIT I :

Basic Structure of Latax 2e – Input file structure – Layout – Editors – Forward search – Inverse Search – Compling – Conversion to various formats.

## UNIT II :

Typesetting simple documents – sectioning – Titles – page layout – listing – enumerating –quote letter formats.

## UNIT III :

Using package amsmath typing equations labeling and refreing.

## UNIT IV:

Figure inclusion – Table inclusion.

## UNIT V:

Bibliography – Intex typing – Beamer presentation Styles.

## TEXT BOOK:

[1] Leslie Lamport, LATEX: A Document preparation System, Addison – Wesley, Reading,Massachusetts, second edition, 1994.

## REFERENCES:

[1] Tobias Oetiker, Hubert Partl, Irenc hyna and Elisabeth Schlegl., The (Not So) Short Introduction to LATEX2e, Samurai Media Limited (or available online at <http://mirrors.ctan.org/info/lshort/English/lshort.pdf>)

[2] LATEX Tutorials – A Primer, Indian Tex Users Group, available online at <https://www.tug.org/twg/mactex/tutorials/ltxprimer-1.0.pdf>)

[3]H.J.Greenberg. A Simplified introduction to LATEX, available online at <http://www.ctan.org/tex-archive/info/simplified-latex/>

[4]Using Kile – KDE Documentation, [https://docs.kde.org/trunk4/en/extragear-office/klie/quick\\_using.html](https://docs.kde.org/trunk4/en/extragear-office/klie/quick_using.html)

## Question Paper Pattern



  
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**ANSWER ALL THE QUESTIONS:**

**1×15 = 15 Marks**

**2× 20 = 40 Marks**

**Record = 5 Marks**

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**Total = 60 Marks**  
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## CC – V THEORY OF EQUATIONS AND VECTOR CALCULUS

**Theory Hours : 6 Course Code : U21MC305**

**Credits : 5 Exam Hours : 3 Internal : 25 External : 75**

### UNIT - I

Relation between the roots and coefficients of polynomial Equations – Symmetric functions – Sum of the  $r^{\text{th}}$  powers of the roots – Newton's Theorem on the sum of the powers of the roots.

### UNIT - II

Transformations of Equations – (Roots with sign changed – Roots multiplied by a given number – Reciprocal roots) – Reciprocal equations – To increase or decrease the roots of given equation by a given quantity – Form the quotient and Remainder when a polynomial is divided by a binomial – Removal of terms – To form an equation whose roots are any power of the roots of a given equation.

### UNIT - III

Vector differentiation – Velocity and acceleration vectors – Vector and scalar fields – Gradient of a vector – Unit normal – Directional derivative – Divergence and curl of a vector – Solenoidal and Irrotational vectors – Laplacian double operators – Simple problems.

### UNIT - IV

Vector Integration – Tangential line integral – Conservative force field – Scalar potential – Normal surface integral – Volume integral – Simple problems.

### UNIT - V

Gauss Divergence theorem – Stoke's theorem – Green's theorem – Simple problems and verification of



*S. Akhila*  
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the theorems for simple problems (statement only).

## TEXT BOOK(S):

- [1] T.K. Manickavasagam Pillai and others, Algebra volume I, S.V. Publications – Reprint – 2013.
- [2] K.Viswanathan and S.Selvaraj, Vector Analysis, Emerald Publishers Reprint 1999.

**UNIT I :** Chapter 6 (sections 11 to 14) of [1].

**UNIT II :** Chapter 6 (sections 15, 16, 17, 18, 19, 20) of [1].

**UNIT III :** Chapter 1 of [2].

**UNIT IV :** Chapter 3 of [2].

**UNIT V :** Chapter 4 of [2].

## REFERENCE(S):

- [1] H.S Hall and S.R Knight ,Higher Algebra, prentice Hall of India, New Delhi.
- [2] J.N. Sharma, A.R. Vasistha, Vector calculus, Krishna Prakashan Media (P) Ltd., 2004. [3] Duraipandian, Laxmi Duraipandian, Vector Analysis, Emerald Publishers,Chennai-2 1986. [4] Advanced Calculus, Robert C. Wrede Murray Spiegel, Tata Mc. Grew Hill, 2002.

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**Total = 75**

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## CC – VII SEQUENCES AND SERIES

**Theory Hours : 5 Course Code : U21MC407 Credits : 5 Exam Hours : 3 Internal : 25 External : 75**


### UNIT – I

Sequence, limit, convergence of a sequence – Cauchy’s general principle of convergence – Cauchy’s first theorem on Limits – Bounded sequence – Monotonic sequence always tends to a limit, finite or infinite.

### UNIT – II

Infinite series Definitions of Convergence, Divergence and Oscillation– Necessary condition for Convergence – Convergence of  $\sum_{n=1}^{\infty} \frac{1}{n^p}$  and Geometric series.



  
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## UNIT – III

Comparison test - D' Alembert's Ratio test and Raabe's test, Simple problems based on above tests.

## UNIT– IV

Cauchy's condensation test - Cauchy's Root test and their simple problems  
– Alternative series with simple problems.

## UNIT – V

Binomial theorem for rational index – Exponential and Logarithmic series. Summation of series and approximations using these theorems.

## TEXT BOOK :

[1] T.K. Manicavachagampillai, T. Natarajan, K.S. Ganapathy, Algebra, Volume – I,  
S.Viswanathan Pvt Limited, Chennai,2013.

UNIT -I : Chapter 2 (sections 1 to7)

UNIT -II : Chapter 2 (sections 8, 9, 10, 11, 12 and14)

UNIT -III : Chapter 2 (Sections13, 16, 18 and19)

UNIT -IV : Chapter 2 (sections 15, 17, 21 to24)

UNIT -V : Chapter 3 (sections 5 to 11, 14) and Chapter 4 (Sections 2, 3, 5 to9).

## REFERENCE (S) :

[1] M.K Singal and Asha Rani Singal, A first course in RealAnalysis,  
R. Chand and Co., 1999.

[2] Dr. S.Arumugam, Sequences and Series, New Gamma Publishers,1999.

[3] Richard, R. Goldberg, Methods of RealAnalysis [Oxford  
and IBH Publishing Co.PvtLTD].

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## CC- IX ABSTRACT ALGEBRA

Theory Hours : 6 Course Code : U21MC509 - Credits : 5 Exam Hours : 3 Internal : 25 External : 75

### UNIT - I Groups

Groups – Introduction – Definition and Examples – Elementary Properties of a Group – Equivalent Definitions of group – Permutation Group -Subgroups – Cyclic groups – Order of an element.

### UNIT - II

Cosets and Lagrange's theorem - Normal subgroups and Quotient groups – Isomorphisms – Homomorphisms .

### UNIT - III Rings

Definition and Examples – Elementary Properties of rings – Isomorphism – Types of rings – Characteristic of a ring – Subrings.

### UNIT - IV

Ideals – Quotient rings – Maximal and prime ideals – Homomorphism of rings – Field of quotients of an integral domain – Ordered integral domain.

### UNIT - V

Unique factorization domain(U.F.D) – Euclidean domain – Every P.I.D. is a U.F.D. – Polynomial Rings – Polynomial Rings over U.F.D. – Polynomials over  $\mathbb{Q}$ .

### TEXT BOOK :

[1] S. Arumugam and A. Thangapandi Isaac, Modern Algebra , Scitech publications  
(India) PVT, Ltd – 2004 1<sup>st</sup> print .

UNIT I : Chapter 3 ( sections 3.0 to 3.7 )

UNIT II : Chapter 3 ( sections 3.8 to 3.11 )

UNIT III : Chapter 4 ( sections 4.1 to 4.6 )

UNIT IV : Chapter 4 ( sections 4.7 to 4.12 )

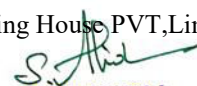
UNIT V : Chapter 4 ( sections 4.13 to 4.18)

### REFERENCE (S):

[1] M.L.SANTIAGO, Modern Algebra, Tata, McGraw–Hill publishing Company  
Limited, New Delhi.

[2] Surjeet singh and Qazi Zameeruddin, Modern Algebra, Vikas publishing House, PVT, Limited. [3]



  
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S.G. Venkatachalapathy, Modern Algebra, Margham Publications, 2008.

[4] I.N. Herstein, Topics in Algebra, John Wiley and Sons, New York, 2003.

## Question Paper Pattern

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**Total = 75**

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## CC – X REAL ANALYSIS

**Theory Hours : 5 Course Code : U21MC510 - Credits : 5 Exam Hours : 3 Internal : 25 External : 75**

### UNIT – I

Sets and functions : sets and elements – Operations on sets – Functions – Real valued functions – Equivalence, countability – Real numbers – Least upper bounds.

### UNIT – II

Limits and metric spaces : Limit of a function on the real line – Metric spaces – Limits in metric spaces.

### UNIT – III

Continuous functions on metric spaces : Functions continuous at a point on the real line – Reformulation – Functions continuous on metric space – Open sets – Closed sets.

### UNIT – IV

Calculus: sets of measure zero – Definition of the Riemann integral – Existence of the Riemann integral – Properties of the Riemann integral – Derivatives – Rolle's theorem – The law of the mean – Fundamental theorem of calculus.

### UNIT – V

Taylor series : Taylor's theorem – The binomial theorem – L'Hospital's rule

TEXT BOOK



  
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[1] RICHARD R.GOLDBERG, Methods of Real Analysis, Oxford and IBHP Publishing co, Pvt., Ltd.,New Delhi,1970.

**UNIT – I :** Chapter 1 (sections 1.1 to 1.7)

**UNIT - II :** Chapter 4 (sections 4.1 to 4.3)

**UNIT – III :** Chapter 5 (sections 5.1 to 5.5)

**UNIT – IV :** Chapter 7 (sections 7.1 to 7.8)

**UNIT - V :** Chapter 8 (sections 8.5 to 8.7)

## REFERENCE(S) :

[1] M.K. Singal and Asha Rani Singal , A First course in Real Analysis,  
R. Chand and Co, publishers, New Delhi,2003.

[2] Shanthi Narayanan, A Course of Mathematical Analysis, S.Chand and  
Co,1995.

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**Total = 75**

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## CC-XII DIFFERENTIAL EQUATIONS

**Theory Hours : 5 Course Code : U21MC512 Practical Hours : - Credits : 4 Exam Hours : 3 Internal : 25 External : 75**

## UNIT - I

**Differential Equations of the first order:** Definitions – Solutions of Differential Equations – Equations of the first order and the first degree – Variables Separable – Homogeneous Equations – Non-Homogeneous Equations



  
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of the first degree in X and Y – Linear Equations – Bernoulli's Equations – Exact Differential Equations – Sufficient Conditions – Rule for Solving an Exact Differential Equations – Rules for Integrating Factors - Equations Solvable of p – Equations Solvable for y – Equations solvable for x – Clairaut's Form.

## UNIT - II

**Linear Differential equations with constant coefficients:** The operators D and  $D^{-1}$  – Particular integral – Special methods of finding particular integral – Linear equations with variable coefficients – Find the particular integral – Equations reducible to the linear homogeneous equation.

## UNIT - III

**Simultaneous Differential equations:** Simultaneous of the first order and first degree – Solution of  $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$  – Methods for solving  $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$  - Geometrical interpretation of  $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$  – Total Differential equations rules for Integrating  $Pdx + Qdy + Rdz = 0$ .

## UNIT - IV

**Partial Differential Equations:** Derivation of Partial Differential Equations – Elimination of arbitrary Constants – Elimination of arbitrary Functions – Different integrals of partial differential Equations – Solutions of PDE in some simple cases.

## UNIT - V

Standard types of first order Equations – Types I, II, III, IV – Lagrange's Equation – Charpit's Method – Standard I, II, III, IV.

## TEXT BOOKS:

[1] S. Narayanan and T.K. Manickavasagam Pillai, Calculus volume– III  
S.Viswanathan (Printers and Publishers), Pvt. Ltd. 2011.

**UNIT I :** Chapter 1 (sections 1.1, 1.2, 1.2.0 – 1.2.5, 1.3.1 - 1.3.3, 1.4, 1.5.1 - 1.5.5, 1.6.1)

**UNIT II :** Chapter 2 (sections 2.1, 2.1.2, 2.2 - 2.4, 2.8, 2.8.1 - 2.8.3, 2.9)

**UNIT III :** Chapter 3 (sections 3.1 - 3.5, 3.7, 3.7.2 - 3.7.4)

**UNIT IV :** Chapter 4 (sections 4.1, 4.2, 4.2.1 - 4.2.3, 4.4)

**UNIT V :** Chapter 4 (sections 4.5, 4.5.1 - 4.5.5, 4.6, 4.6.1, 4.7, 4.7.1 )

## REFERENCE(S):

[1] P.R. Vittal, V. Malini, Calculus, Margham, Publications, 2004.


[2] Dr. M.K. Venkataraman, Mrs. Manorama Sridhar, Differential equations and Laplace Transforms, National publishing company, 2004.

[3] S. Narayanan, T.K. Manikavachagom pillai, Differential Equations and its Applications viswanathan printers, 2007.

[4] Arumugam Issac, Allied Mathematics, New Gamma Publishing house, 2007.

## Question Paper Pattern



  
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**SECTION B :**  $5 \times 5 = 25$  (Each Unit Carries Two Questions (Either or Type ))

**SECTION C :**  $3 \times 5 = 30$  (Each Unit Carries One Questions )

-----  
**Total = 75**  
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## CC – XIII COMPLEX ANALYSIS

**Theory Hours : 6 Course Code : U21MC613 Practical Hours : - Credits : 5 Exam Hours : 3 Internal : 25 External : 75**

### UNIT - I

Functions of a complex variable – Limits – Theorems on Limits – Continuous functions – Differentiability – Cauchy - Riemann equations – Analytic functions – Harmonic functions.

### UNIT - II

Elementary transformations – Bilinear transformations – Cross ratio – Fixed points of Bilinear transformations – Some special bilinear transformations.

### UNIT - III

Complex Integration: Definite integral – Cauchy's theorem – Cauchy's integral formula – Higher derivatives.

### UNIT - IV

Series Expansions: Taylor's series – Laurent's series – Zeros of analytical functions – Singularities.

### UNIT - V

Residues – Cauchy's Residue theorem – Evaluation of definite integrals.

### TEXT BOOK:

[1] S.Arumugam, A.Thangapandi Isaac and A.Somasundaram, Complex Analysis, New Scitech publications (India) Pvt.Ltd. November 2003.

**UNIT I :** Chapter 2 (sections 2.1 to 2.8)

**UNIT II :** Chapter 3 (sections 3.1 to 3.5)

**UNIT III :** Chapter 6 (sections 6.1 to 6.4)

**UNIT IV :** Chapter 7 (sections 7.1 to 7.4)

**UNIT V :** Chapter 8 (sections 8.1 to 8.3)



  
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## REFERENCE(S)

[1] P.P.Gupta – Kedarnath and Ramnath, Complex Variables, Meerut-Delhi.

[2] J.N.Sharma, Functions of a Complex Variable, Krishna Prakasan Media(p) Ltd. 13<sup>th</sup> Edition, 1996-97.

[3] T.k. Manickavachagam Pillai, Complex Analysis, S.Viswanathan Publishers pvt. Ltd.1994.

## COURSE OUT COMES:

The students will be able to

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**Total = 75**

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## MBEC – II NUMERICAL ANALYSIS

Theory Hours : 6 Course Code : U21M6MBE2:1 Practical Hours : - Credits : 5 Exam Hours : 3 Internal : 25 External : 75

### UNIT - I

Algebraic and Transcendental equations – Finding the solution of the given equation using bisection method, Method of false position, Newton-Raphson method, Iteration method.

### UNIT - II


Finite differences – Forward, Backward and central differences – Newton's Forward and backward difference interpolation formulae – Interpolation with unevenly spaced points – Lagrange's interpolation formula.

### UNIT - III

Numerical Integration - Using Trapezoidal rule and Simpson's  $1/3$  and  $3/8$  - rules.

### UNIT - IV



  
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Solution to Linear systems – Gauss Elimination method – Jacobi and Gauss Siedal iterative methods.

## UNIT - V

Numerical solution of ODE – Solution by Taylor's series method, Picard's method, Euler's method, Runge kutta second and fourth order methods.

### TEXTBOOK :

[1] S.S Sastry, Introductory methods of Numerical Analysis, Prentices Hall of India Pvt.Limited,2001,Third Edition.

**UNIT I :** Chapter 2 (sections 2.2, 2.3, 2.4, 2.5)

**UNIT II :** Chapter 3 (sections 3.3.1, 3.3.2, 3.3.3, 3.6, 3.9, 3.9.1)

**UNIT III :** Chapter 5 (sections 5.4, 5.4.1, 5.4.2, 5.4.3)

**UNIT IV :** Chapter 6 (sections 6.3, 6.3.2) and  
Chapter 8 (sections 8.3.1 , 8.3.2)

**UNIT V :** Chapter 7 (sections 7.1, 7.2, 7.3, 7.4,7.5).

### REFERENCE(S):

[1] S.Narayanan and others, Numerical Analysis, S.Viswanathan Publishers, 1994,

[2] A.Singaravelu, Numerical methods, Meenachi Agency, June 2000.

[3] E. Kendall, Atkinson, An Introduction to Numerical Analysis, II Edition, John wiley& Sons, 1989.

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-----

**Total = 75**

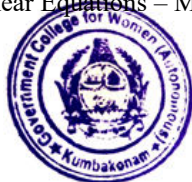
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### CC - I LINEAR ALGEBRA

**Theory Hours : 6 Course Code : P21MC101 Exam Hours : 3 Credits : 5 Internal : 25  
External : 75**

### UNIT I :

Systems of linear Equations – Matrices and Elementary Row operations – Row -Reduced Echelon matrices – Matrix



  
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multiplication – Invertible matrices – Vector spaces – Subspaces – Bases and Dimension – Co ordinates.

## UNIT II :

The algebra of linear transformations – Isomorphism of vector spaces – Representations of Linear Transformations by Matrices – Linear functional – The Double Dual – The Transpose of Linear Transformation.

## UNIT III :

The algebra of polynomials – Lagrange Interpolation – Polynomial Ideals – The prime factorization of a polynomial, Commutative rings – Determinant functions – permutations and the uniqueness of determinants – Additional properties of Determinants.

## UNIT IV :

Characteristic values – Annihilating polynomials, Invariant subspaces – simultaneous triangulation and simultaneous Diagonalization – Direct- sum – Decompositions.

## UNIT V :

Invariant Direct sums – The primary Decomposition Theorem – Cyclic subspaces – Cyclic Decompositions and the Rational Form.

## TEXT BOOK :

[1] Kenneth Hoffman and Ray kunze, Linear Algebra second Edition, prentice –Hall of India private limited, New Delhi, 2005.

UNIT I : Chapter 1 and chapter 2 (sections 2.1 to 2.4 )

UNIT II : Chapter 3

UNIT III : Chapter 4 and Chapter 5 (sections 5.1 to 5.4)

UNIT IV : Chapter 6 (sections 6.1 to 6.6)

UNIT V : Chapter 6 (sections 6.7, 6.8) and chapter 7 (sections 7.1, 7.2)

## REFERNCES:

[1] I.N. Herstein, Topics in Algebra, Wiley Eastern Limited, New Delhi, 1975.

[2] I.S. Luther and I.B.S. Passi, Algebra, volume II – Rings, Narosa publishing House, 1999.

[3] N. Jacobson. Basic Algebra, vols. I and II Freeman, 1980 (also published by Hindustan Publishing Company).

## Question Paper Pattern

SECTION A  $10 \times 2 = 20$  (Each Unit Carries Two Questions )

SECTION B  $5 \times 5 = 25$  (Each Unit Carries Two Questions (Either or Type ))

SECTION C  $3 \times 5 = 30$  (Each Unit Carries One Questions )


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Total = 75

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CC - V ALGEBRA

  
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**Theory Hours : 6 Course Code : P21MC205 Exam Hours : 3 Credits : 5 Internal : 25 External : 75**

## UNIT I:

Another counting principle – Sylow's theorem – Direct Products – Finite Abelian Groups.

## UNIT II:

More Ideals and Quotient rings – Polynomial rings – Polynomial over the rational field – Polynomial rings over Commutative rings.

## UNIT III :

Dual spaces – Inner Product spaces – Modules – Orthogonal Complement – Orthogonal Basis – left module over a Ring – Submodule – Quotient module – Cyclic module – Structure Theorem for Finitely Generated Modules over Euclidean Rings.

## UNIT IV :

Fields : Extension Fields – Roots of Polynomials – More about roots.

## UNIT V :

The Elements of Galois Theory – Solvability by Radicals – Finite Fields.

## TEXT BOOK :

[1] I.N Herstein, Topics in Algebra, Second Edition John Wiley and Sons, 1975.

**UNIT I :** Chapter 2 (sections 2.11, 2.12, 2.13 and 2.14)

**UNIT II :** Chapter 3 (sections 3.5, 3.9, 3.10 and 3.11)

**UNIT III :** Chapter 4 (sections 4.3, 4.4 and 4.5)

**UNIT IV :** Chapter 5 (sections 5.1, 5.3 and 5.5)

**UNIT V :** Chapter 5 (sections 5.6, 5.7) and Chapter 7 (Section 7.1)


## REFERENCES :

[1] Surjeet Singh, Qazi Zammeruddin, Modern Algebra, Vikas Publishing House private Limited, 1972. [2] John B.Fraleigh, A first course in Abstract Algebra, Pearson Education privat Limited, 2003. [3] Vijay K.Khanna and S.K Bhambri, A course in Abstract Algebra, Vikas Publishing House private limited, 1993.

[4] John B. Fraleigh, A First Course in Abstract Algebra, Seventh Edition, Instructor's Solution Manual, University of Rhode Island, July 2002.

## Question Paper Pattern



  
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SECTION A  $10 \times 2 = 20$  (Each Unit Carries Two Questions )  
SECTION B  $5 \times 5 = 25$  (Each Unit Carries Two Questions (Either or Type ))  
SECTION C  $3 \times 5 = 30$  (Each Unit Carries One Questions )

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Total = 75

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## CC – VII COMPLE X ANALYSIS

**Theory Hours : 5 Course Code : P21MC207 Exam Hours : 3 Credits : 5 Internal : 25 External : 75**

### Objectives:

1. The concepts of derivation of analytic functions.
2. Express the Cauchy's derivative formulas.

### UNIT I :

Conformality: Arcs and Closed Curve – Analytic Functions in Regions – Conformal Mapping – Length and Area. Linear Transformations: The Linear Group – The Cross Ratio – Symmetry.

Fundamental Theorems in complex Integration: Line Integrals – Rectifiable Arcs – Line Integrals as Functions of Arcs – Cauchy's Theorem for a Rectangle – Cauchy's Theorem in a Disk. Cauchy's Integral Formula: The Index of a point with respect to a closed curve – The Integral Formula – Higher Derivatives.

Local Properties of Analytic Functions: Removable singularities – Taylor's Theorem – Zeros and poles – The Local mapping – The maximum principle .

### UNIT IV :

The General Form of Cauchy's Theorem : Chains and Cycles – Simple connectivity – Multiply Connected Regions. The Calculus of Residues: The Residue Theorem – The Argument Principle – Evaluation of Definite Integrals.


### UNIT V :

Harmonic Functions: Definition and Basic Properties – The mean value Property – Poisson's Formula – Schwarz's Theorem – Power Series Expansions: Weierstrass's Theorem – The Taylor Series – The Laurent Series.

### TEXT BOOK:

[1] Lars.V.Ahlfors, Complex Analysis, Third Edition McGraw-Hill book Company, Tokyo, 1979.



  
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UNIT I : Chapter 3 (sections 2.1 to 2.4 , 3.1 to 3.3)

UNIT II : Chapter 4 (sections 1.1 to 1.5, 2.1 to 2.3)

UNIT III : Chapter 4 (sections 3.1 to 3.4)

UNIT IV : Chapter 4 (sections 4.1, 4.2, 4.7, 5.1 to 5.3)

UNIT V : Chapter 4 (sections 6.1 to 6.4) Chapter 5: (sections 1.1 to 1.3)

## REFERENCES :

[1] S Ponnusamy , Foundation of complex Analysis, Narosa Publishing House .1995

[2] V Karunakaran, complex analysis, Narosa publishing House, 2005.

[3] J.B. Conway, Functions of one Complex Variable, Narosa, 2nd edition, 1991.

## Question Paper Pattern

SECTION A  $10 \times 2 = 20$  (Each Unit Carries Two Questions )

SECTION B  $5 \times 5 = 25$  (Each Unit Carries Two Questions (Either or Type ))

SECTION C  $3 \times 5 = 30$  (Each Unit Carries One Questions )

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Total = 75

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## CC – VIII THEORY OF NUMBERS

Theory Hours : 5 Course Code : P21MC208 Exam Hours : 3 Credits : 4 Internal :  
25 External : 75

### UNIT I :

**Fundamentals of Congruence's:** Basic properties of Congruence's – Residue Systems – Solving Congruence's: Linear Congruence's – The Theorems of Fermat and Wilson Revisited

### UNIT II :

The Chinese Remainder Theorem – Polynomial Congruence's. Arithmetic functions: Combinatorial study of  $\Phi(n)$  – Formulae for  $d(n)$  and  $\sigma(n)$  – Multiplicative Arithmetic functions – The mobius Inversion formula

### UNIT III :

**Quadratic Residues:** Euler's criterion – The Legendre symbol – The Quadratic reciprocity law –



  
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Applications of the Quadratic reciprocity law

## UNIT IV :

**Sums of Squares:** sums of two squares – Sums of Four Squares – Elementary Partition theory: Graphical representation – Euler's partition theorem – Searching for partition identities .

**Partition Generating Function:** Infinite products as Generating functions –Identities between infinite series and Products . Partitions Identities : History and Introduction – Euler's Pentagonal number theorem.

## TEXT BOOK :

[1] George E. Andrews, Number theory, Dover Publication, INC, New York, Reprint 2013.

**UNIT I :** Chapter 4 (sections 4.1, 4.2) and Chapter 5 (sections 5.1, 5.2)

**UNIT II :** Chapter 5 (sections 5.3,5.4) and Chapter 6 (sections 6.1 to 6.4)

**UNIT III :** Chapter 9 (sections 9.1 to 9.4)

**UNIT IV :** Chapters 11 and 12

**UNIT V :** Chapter 13 and Chapter 14 (sections 14.1, 14.2)

## REFERENCES:

[1] Dr. Sudhir Pundir and Dr. Rimple Pundir, Theory of Numbers, First Edition, Pragasi Prakashan Publications, 2006.

[2] Gareth A. Jones and J. Mary Jones, Elementary Number Theory, Springer Verlag, Indian Reprint, 2005.

[3] David M. Burton, Elementary Number theory, 6<sup>th</sup> edition, McGraw Hill, 2007.

[4] J. William, Fundamentals of Number Theory, Leveque, Addison-Wesley Publishing Company, Phillipines, 1977.

## Question Paper Pattern

SECTION A  $10 \times 2 = 20$  (Each Unit Carries Two Questions )

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SECTION C  $3 \times 5 = 30$  (Each Unit Carries One Questions )

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Total = 75

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## MBEC – II STOCHASTIC PROCESSES

**Theory Hours : 5 Course Code : P21M2MBE2:1 Exam Hours : 3 Credits : 3 Internal : 25 External : 75**



  
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**Stochastic Processes:** Some Notions – Specification of Stochastic Processes – Stationary Processes – Markov Chains : Definitions and Examples – Higher Transition Probabilities.

## UNIT II :

Generalization of Independent Bernoulli Trails – Sequence of Chains – Dependent Trials. **Markov Chains:** Classification of states and chains – Determination of Higher Transition probabilities – Stability of a Markov system.

## UNIT III:

**Markov processes with Discrete state space:** Poisson processes and its Extensions – Poisson processes and related distributions – Birth and Death process .

Renewal Processes and Theory: Renewal Process – Renewal Processes in continuous time – Renewal equations – Stopping time – Wald's equation.

Stationary Processes and Time Series: Models of Time Series – Time and Frequency domain: Power Spectrum – Statistical Analysis of Time Series.

## TEXT BOOK:

[1] J.Medhi, Stochastic Processes, Second Edition, New Age International Private Limited, New Delhi, 1994.

**UNIT I :** Chapter 2 (Sections 2.1 to 2.3,) and Chapter 3 (Sections 3.1 , 3.2 )

**UNIT II :** Chapter 3 (Sections 3.3 to 3.6 )

**UNIT III :** Chapter 4 (Sections 4.1, 4.2, 4.4)

**UNIT IV :** Chapter 6 (Sections 6.1 to 6.4 )

**UNIT V :** Chapter 8 (Sections 8.2 to 8.4)

## REFERENCES :

[1] Samuel Korlin, Howard M.Taylor, A First course in Stochastic Processes, Second Edition.


[2] Narayan Bhat, Elements of Applied Stochastic Processes.

[3] S.K. Srinivasan and K. Mehata, Stochastic Processes, Tata McGraw Hill 1976.

[4] Oliver Knill, Probability Theory and Stochastic Process with Applications, Overseas Press (India), Pvt. Ltd, Edition 2009.

## Question Paper Pattern



  
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SECTION A  $10 \times 2 = 20$  (Each Unit Carries Two Questions )

SECTION B  $5 \times 5 = 25$  (Each Unit Carries Two Questions (Either or Type ))

SECTION C  $3 \times 5 = 30$  (Each Unit Carries One Questions )

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Total = 75

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**CC – X MEASURE THEORY AND INTEGRATION**

**Theory Hours : 6 Course Code : P21MC310 Exam Hours : 3 Credits : 5 Internal : 25 External : 75**

**Measure on the Real Line:** Lebesgue Outer Measure – Measurable Sets – Regularity – Measurable Function – Borel and Lebesgue Measurability.

**Integration of Functions of a Real Variable:** Integration of Non-negative Functions – The General Integral – Integration of Series – Riemann and Lebesgue Integrals.

**UNIT III :**

**Inequalities and the  $L^p$  Spaces:** The  $L^p$  spaces – Convex functions – Jensen's Inequalities – The Inequalities of Holders and Minkowski.

**UNIT IV :**

Convergence in Measure – Almost Uniform Convergence – Singed Measures and Hahn Decomposition – The Jordan Decomposition.


**UNIT V :**

Measurability in a Product Space – The Product Measure and Fubini's Theorem. The Radon – Nikodym Theorem.

**TEXT BOOK:**

[1] G.de. Barra, Measure Theory and Integration, First Edition, New Age



  
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International Private Limited, Reprint 2003.

**UNIT I :** Chapter 2 (sections 2.1 to 2.5)

**UNIT II :** Chapter 3 (sections 3.1 to 3.4)

**UNIT III :** Chapter 6 (sections 6.1 to 6.4)

**UNIT IV :** Chapter 7 (sections 7.1 , 7.2 ) and Chapter 8(sections 8.1, 8.2)

**UNIT V :** Chapter 10 (sections 10.1, 10.2) and Chapter 8(section 8.3)

## REFERENCES :

[1] Inder K. Rana, An Introduction to Measure and Integration, Narosa Publishing House, New Delhi, 1997.

[2] M.E. Munroe, Measure and Integration, Second Edition, Addition – Wesley Publishing Company, 1971.

[3] P.K. Jain, V.P Gupta, Lebesgue Measure and Integration, New Age International Pvt. Ltd. Publishers, New Delhi, 1986 (Reprint 2000)

[4] Richard L. Wheeden and Andoni Zygmund, Measure and Integral: An Introduction to Real Analysis, Marcel Dekker Inc 1977.

## Question Paper Pattern

SECTION A  $10 \times 2 = 20$  (Each Unit Carries Two Questions )

SECTION B  $5 \times 5 = 25$  (Each Unit Carries Two Questions (Either or Type ))

SECTION C  $3 \times 5 = 30$  (Each Unit Carries One Questions )

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Total = 75

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## CC - XI TOPOLOGY

**Theory Hours : 6 Course Code : P21MC311 Exam Hours : 3 Credits : 5 Internal : 25 External : 75**


### UNIT I :

**Topological Spaces:** Topological Spaces – Basis for a Topology – The order Topology. The Product Topology on  $X \times Y$  – The Subspace Topology.

### UNIT II :

Closed Sets and Limit points – Continuous Functions : Continuous Functions – The Product Topology.



  
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## UNIT III :

**Connectedness:** Connected Spaces – Connected Subspaces of the Real Line – Components and local Connectedness

## UNIT IV :

**Compactness:** Compact Spaces – Compact Subspaces of the Real Line – Limit point Compactness – local Compactness

## 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.

## TEXT BOOK :

[1] James R. Munkres, Topology, Second Edition, Prentice – Hall of India private Limited, New Delhi, 2013.

UNIT I : Chapter 2 (Sections 12 to 16)

UNIT II : Chapter 2 (Sections 17 to 19)

UNIT III : Chapter 3 (Sections 23 to 25)

UNIT IV : Chapter 3 (Sections 26 to 29)

UNIT V : Chapter 4 (Sections 30 to 35)

## REFERENCES :

[1] J. Dugundji, Topology, Prentice Hall of India, New Delhi, 1976.

[2] Sheldon W. Davis, Topology, UBS Publishers Distributors Private Limited, New Delhi, 1989.

[3] G. F. Simmons, Introduction to Topology and Modern Analysis, McGraw Hill, 1963.

[4] S. Willard, General Topology, Addison-Wesley, 1970.

## Question Paper Pattern

SECTION A  $10 \times 2 = 20$  (Each Unit Carries Two Questions )

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SECTION C  $3 \times 5 = 30$  (Each Unit Carries One Questions )


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Total = 75

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## CC – XIII FUNCTIONAL ANALYSIS



  
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Theory Hours : 6 Course Code : P20MC413 Exam Hours : 3 Credits : 4 Internal :  
25 External : 75

## UNIT I :

**Banach Spaces:** The definition and some examples – Continuous Linear Transformations – The Hahn Banach Theorem.

The Natural Imbedding of  $\mathbb{N}$  in  $\mathbb{N}^{**}$  – The open Mapping Theorem – The conjugate of an operator. UNIT

## III :

**Hilbert Spaces:** The definition and some simple properties – Orthogonal Complements – Orthonormal sets – The Conjugate space  $H^*$  – The adjoint of an operator – Self - adjoint operators – Normal and Unitary operators – Projections.

## UNIT IV :

**Finite – Dimensional Spectral Theory:** Matrices – Determinants and the spectrum of an operator – The Spectral Theorem – A survey of the situation.

**General Preliminaries on Banach Algebras:** The definition and some examples – Regular and singular elements – Topological divisors of zero – The spectrum – The formula for the Spectral radius – The radical and semi – Simplicity. The structure of Commutative **Banach Algebras:** The Gelfand Mapping – Applications of the formula  $r(x) = \lim \|x^n\|^{1/n}$ .

## TEXT BOOK:

[1] G.F. Simmons, Introduction to Topology and Modern Analysis, Tata McGraw Hill International Edition, 2005.

UNIT I : Chapter 9 (sections 46 to 48)

UNIT II : Chapter 9 (sections 49 to 51)

UNIT III : Chapter 10

UNIT IV : Chapter 11

UNIT V : Chapter 12 and chapter 13 (sections 70, 71)

## REFERENCE(S):


[1] B.V Limaye, Functional Analysis, New Age International Private Limited, 1996.

[2] Walter Rudin, Functional Analysis, TMH Edition, 1974.

[3] K. Yosida, Functional Analysis, Springer - Verlag, 1974.

[4] Laurent Schwarz, Functional Analysis, Courant Institute of Mathematical Sciences, New York University, 1964.



  
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SECTION C  $3 \times 5 = 30$  (Each Unit Carries One Questions )

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Total = 75

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## CC – XII - INTEGRAL EQUATIONS, CALCULUS OF VARIATIONS AND FOURIER TRANSFORMS

**Theory Hours : 6 Course Code : P21MC312 Exam Hours : 3 Credits : 5 Internal : 25 External : 75**

### UNIT I :

Calculus of variations – Maxima and Minima – The simplest Case – Natural Boundary and Transition conditions – Variational notation – More general case – Constraints and Lagrange’s Multipliers – Variable end points – Strum Liouville problems.

### UNIT II :

Fourier Transforms – Fourier Sine and Cosine transforms – properties – Convolution – solving Integral equations – Finite Fourier Transforms – Finite Fourier Sine and Cosine transforms – Fourier Integral Theorem – Parseval’s identity.

### UNIT III :

**Hankel Transforms:** Definition – Inverse formula – Some important results for Bessel functions – Linearity Property – Hankel Transform of the derivatives of the function – Hankel Transform of differential operators – Parsaval’s Theorem.

### UNIT IV :

**Linear Integral Equations:** Definition, Regularity Conditions – Special kind of kernels – Eigen values and Eigen functions – Convolution Integral – The inner or scalar product of two functions – Notation – Reduction to a system of Algebraic equations – Examples – Fredholm alternative – Examples – An approximate method.

### UNIT V :


**Method of successive Approximations:** Iterative scheme – Examples – Volterra Integral Equation – Examples – Some results about the Resolvent Kernel. **Classical Fredholm Theory:** The method of solution of Fredholm – Fredholm’s First Theorem – Second Theorem – Third Theorem.

### TEXT BOOKS:

[1] Ram. P. Kanwal, Linear Integral Equations Theory and Technique, Academic Press 1971.

[2] F.B. Hildebrand, Methods of Applied Mathematics, second Edition, PHI, New Delhi, 1972.



  
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[3] A.R. Vasishtha and R.K. Gupta, Integral Transforms, second Revised Edition  
Krishna Prakashan Media, Private Limited, India. 1975.

**UNIT I** : Chapter 2 (sections 2.1 to 2.9) of (2)

**UNIT II** : Chapter 6 and Chapter 7 (sections 7.1 to 7.4) of [3]

**UNIT III** : Chapter 9 of [3]

**UNIT IV** : Chapters 1 and 2 of [1]

**UNIT V** : Chapters 3 and 4 of [1]

**REFERENCE:**

[1] I.N. Shedden, Mixed Boundary value problems in practical Theory, North  
Holland, 1966.

[2] S.J. Mikhlin, Linear integral equations (translated from Russian), Hindustan Book  
Agency, 1960.

[3] I.N. Snedden, Mixed Boundary value problems in potential theory, North Holland,  
1966.

[4] R.T. Rockafellar and R.J.B. Wets, Variational Analysis, springer, Grundlehren  
317 (1998).

**Question Paper Pattern**

SECTION A  $10 \times 2 = 20$  (Each Unit Carries Two Questions )

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SECTION C  $3 \times 5 = 30$  (Each Unit Carries One Questions )

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Total = 75

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