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Mathematics Major (Honours) · Semester 7

Semester-wise syllabus · 4-Year Major · DSCC and SEC papers

What this file contains

- DSCC-16 to DSCC-20 (Semester 7 papers)
- Question pattern for Semester 7
- Course structure page and question pattern

Source and note

The pages that follow are taken unchanged from the official University of Calcutta syllabus for Mathematics under the Curriculum and Credit Framework for Undergraduate Programmes (CCF, NEP 2020). PALMATHS has only selected the pages for this programme and semester and added this cover so students can find them quickly. Always check the University of Calcutta website (caluniv.ac.in) for later notifications, corrections or changes in paper options. PALMATHS is an independent coaching centre and is not part of, or endorsed by, the University of Calcutta.

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University of Calcutta



Syllabus for four-year (Eight Semester) B. Sc. Honours and Honours with Research Course with Mathematics Major

&

Mathematics as a Minor subject

and

Syllabus for three-year (Six Semester) Multidisciplinary Course with Mathematics

Under

Curriculum and Credit Framework (CCF)

Odd Semester : July to December

Even Semester : January to June

The syllabus for the 4 Year B.A./B.Sc. Honours and Honours with Research Course with Mathematics Major is effective from the academic year **2023-24**.

The syllabus for the 3 Year Multidisciplinary Course with Mathematics is effective from the academic year **2023-24**.

Semester	Course	Paper Code	Name of Paper	Credit	Page
SEVEN (VII)	MAJOR	MTHM-DSCC 16	Group Theory - III & Linear Algebra - II	3TH+1TU=4	41
	MAJOR	MTHM-DSCC 17	Complex Analysis - II & Measure Theory - I	3TH+1TU=4	43
	MAJOR	MTHM-DSCC 18	Generalised functions, Integral Transforms Integral Equations	3TH+1TU=4	45
	MAJOR	MTHM-DSCC 19	Topology - I	3TH+1TU=4	47
	MAJOR	MTHM-DSCC 20	Functional Analysis - I	3TH+1TU=4	49
EIGHT (VIII)		**Honours without Research**			
	MAJOR	MTHM-DSCC 21	Ordinary Differential Equation - II & Partial Differential Equation - II	3TH+1TU=4	51
	MAJOR	MTHM-DSCC 22	Graph Theory	3TH+1TU=4	53
	MAJOR	MTHM-DSCC 23.1	Mechanics - III	3TH+1TU=4	55
		or	or		
	MAJOR	MTHM-DSCC 23.2	Measure Theory - II	3TH+1TU=4	57
	MAJOR	MTHM-DSCC 24.1	Operations Research & Stochastic Process	3TH+1TU=4	59
		or	or		
	MAJOR	MTHM-DSCC 24.2	Differential Geometry	3TH+1TU=4	61
	MAJOR	MTHM-DSCC 25.1	Fluid Mechanics & Computational Mathematics	3TH+1P=4	63
		or	or		
	MAJOR	MTHM-DSCC 25.2	Functional analysis - II & Topology - II	3TH+1TU=4	66
		Honours with Research			
	MAJOR	MTHM-RM1	Research Methodology - I	3TH +1Viva =4	68
	MAJOR	MTHM-RM2	Research Methodology - II	3TH +1Viva =4	70
	MAJOR		Research Internship	4	107
	MAJOR		Dissertation/Project	8	108

Note.

1. MMTH-MN3 and MMTH-MN4 (both) shall be studied in either Semester Five or in Semester Six.
2. If Mathematics is chosen as Core Course 2 in MDC then only CC6 (Statistical & Numerical Analysis) will be taught in Semester Five and the papers CC7 (Mathematical Methods) and CC8 (Discrete Mathematics) will be taught in Semester Six.
3. **Refer to Notification No. CSR/36/2023 and Notification No. CSR/35/2024 for the Syllabus and Question Pattern for the paper "Artificial Intelligence".**
4. Marks for Tutorial will be awarded on the basis of Internal Assessment through evaluation of internal assignments for SEC papers and internal examinations for Core, Minor and IDC papers.

4-yr Credit Distribution | MDC Credit Distribution | Course Overview

Major | Minor | MDC | Question Pattern

Course Structure for
4-year B.A./B.Sc. Honours & Honours with Research, with Mathematics Major

Semester	Paper Code	Name of Paper	Credit	Page No.
I	MTHM-DSCC 1	Calculus, Geometry & Vector Analysis	3TH+1TU = 4	10
	MTHM-SEC 1	C language with Mathematical Applications	3TH+1TU = 4	73
II	MTHM-DSCC 2	Basic Algebra	3TH+1TU=4	12
	MTHM-SEC 2.1 or MTHM-SEC 2.2	Python Programming & Introduction to Latex or *Artificial Intelligence	3TH+1TU=4	75
III	MTHM-DSCC 3	Real Analysis	3TH+1TU=4	14
	MTHM-DSCC 4	Ordinary Differential equations - I & Group Theory - I	3TH+1TU=4	16
	MTHM-SEC 3	Linear Programming & Rectangular Games	3TH+1TU=4	78
IV	MTHM-DSCC 5	Theory of Real Functions	3TH+1TU=4	18
	MTHM-DSCC 6	Mechanics - I	3TH+1TU=4	20
	MTHM-DSCC 7	Multivariate Calculus–I & Partial Differential Equation - I	3TH+1TU=4	22
	MTHM-DSCC 8	Group Theory - II & Ring Theory - I	3TH+1TU=4	25
V	MTHM-DSCC 9	Probability & Statistics	3TH+1TU=4	27
	MTHM-DSCC 10	Ring Theory - II & Linear Algebra - I	3TH+1TU=4	29
	MTHM-DSCC 11	Riemann Integration & Series of Functions	3TH+1TU=4	31
	MTHM-DSCC 12	Mechanics - II	3TH+1TU=4	33
VI	MTHM-DSCC 13	Metric Space & Complex Analysis-I	3TH+1TU=4	35
	MTHM-DSCC 14	Multivariate Calculus II & Applications of Calculus	3TH+1TU=4	37
	MTHM-DSCC 15	Numerical Analysis	3TH+1P=4	39
VII	MTHM-DSCC 16	Group Theory-III & Linear Algebra-II	3TH+1TU=4	41
	MTHM-DSCC 17	Complex Analysis - II & Measure Theory - I	3TH+1TU=4	43
	MTHM-DSCC 18	Generalised functions, Integral Transforms Integral Equations	3TH+1TU=4	45
	MTHM-DSCC 19	Topology - I	3TH+1TU=4	47
	MTHM-DSCC 20	Functional Analysis - I	3TH+1TU=4	49
VIII		**Honours**		
	MTHM-DSCC 21	Ordinary Differential Equation - II & Partial Differential Equation - II	3TH+1TU=4	51
	MTHM-DSCC 22	Graph Theory	3TH+1TU=4	53
	MTHM-DSCC 23.1 or MTHM-DSCC 23.2	Mechanics - III or Measure Theory - II	3TH+1TU=4 3TH+1TU=4	55 57
	MTHM-DSCC 24.1 or MTHM-DSCC 24.2	Operations Research & Stochastic Process or Differential Geometry	3TH+1TU=4 3TH+1TU=4	59 61
	MTHM-DSCC 25.1 or MTHM-DSCC 25.2	Fluid Mechanics & Computational Mathematics or Functional analysis - II & Topology - II	3TH+1P=4 3TH+1TU=4	63 66
		Honours with Research		
	MTHM-RM1	Research Methodology - I	3TH +1Viva =4	68
	MTHM-RM2	Research Methodology - II	3TH +1Viva =4	70
		Research Internship	4	107
		Dissertation/Project	8	108

***Refer to Notification No. CSR/36/2023 and Notification No. CSR/35/2024 for the Syllabus and Question Pattern for the paper "Artificial Intelligence".**

4-yr Credit Distribution | MDC Credit Distribution | Course Overview

Major | Minor | MDC | Question Pattern

Group Theory - III & Linear Algebra - II

Semester : VII Credit : 4	Paper Code : MTHM-DSCC 16-TH Full Marks : 100 (Theory : 75 & Tutorial : 25)
Minimum number of classes required : 60	

4-yr Credit Distribution | MDC Credit Distribution | Course Overview

Major | Minor | MDC | Question Pattern

Course Outcome

CO1 :

Group A : Group Theory - III [Marks : 35] [28 classes]

- Finite Abelian group, Fundamental theorem of finite Abelian groups, classification of all non-isomorphic Abelian groups of a given finite order, finitely generated free Abelian groups, structure of finitely generated free Abelian groups, torsion of a group.
- Group actions, permutation representation of group action, orbit, stabilizer, Applications of group actions - Generalized Cayley's theorem (extended Cayley's theorem), Index theorem, Burnside theorem.
- Groups acting on themselves by conjugation, conjugacy classes, class equation and consequences, conjugacy in S_n, Cauchy's theorem on finite groups, p-group, Centre of p-groups, Sylow's theorems, some applications of Sylow's theorems, simple groups, non-simplicity of groups of order $p^n\,(n > 1), pq, p^2q, p^2q^2$ (p, q are distinct primes), determination of all simple groups of order less than or equal to 60, non-simplicity of $A_n\,(n \geq 5)$, uniqueness of simple group of order 60.

Group B : Linear Algebra - II [Marks : 40] [32 classes]

- Finite dimensional inner product spaces and norms, Gram-Schmidt orthonormalisation process, orthogonal complements, Bessel's inequality, the adjoint of a linear operator and its basic properties.
- Bilinear and quadratic forms, Diagonalisation of symmetric matrices, Second derivative test for critical point of a function of several variables, Hessian matrix, Sylvester's law of inertia (statement only). Index, signature.
- Fundamental theorem of Linear Algebra (Part - I and Part - II), existence and uniqueness of solutions to $Ax = b$, a matrix transforms its row space to its column space.
- Duality and transposition, linear forms or linear functionals, dual space V^d, bi-dual space V^{dd}, dual basis, natural isomorphism between V and V^{dd}, Annihilators W^0 of a nonempty subset W of a vector space V. $\dim W^0 = \dim V - \dim W$ where W is a subspace of V, transpose T^t of a linear transformation T, $T^{tt} = T$, $(T^t)^{-1} = (T^{-1})^t$ if T is an isomorphism, $(\mathrm{Im}\,T)^0 = \ker T^t$, $\dim(\mathrm{Im}\,T) = \dim(\mathrm{Im}\,T^t), (\ker T)^0 = \mathrm{Im}\,T^t$. Eigenspaces of a linear operator, diagonalizability, invariant subspaces and Cayley-Hamilton theorem, the minimal polynomial for a linear operator, canonical forms (Jordan & rational) [problems only].

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4-yr Credit Distribution | MDC Credit Distribution | Course Overview

Major | Minor | MDC | Question Pattern

Complex Analysis - II & Measure Theory - I

Semester : VII	Paper Code : MTHM-DSCC 17-TH
Credit : 4	Full Marks : 100 (Theory : 75 & Tutorial : 25)
Minimum number of classes required : 60	

4-yr Credit Distribution | MDC Credit Distribution | Course Overview
Major | Minor | MDC | Question Pattern

Course Outcome

CO1 :

Group A : Complex Analysis - II [Marks : 40] [32 classes]

- Curves in the complex plane, complex line integrations and its properties, fundamental theorem of calculus, Cauchy-Goursat theorem (statement only), Cauchy's integral formula, Cauchy's integral formula for derivatives (statement only), Morera's theorem, Liouville's theorem, fundamental theorem of algebra.
- Maximum Modulus theorem (statement only) and its applications, Minimum Modulus Theorem (statement only).
- Taylor's theorem, Laurent's theorem (statement only), zeros of an analytic function, interior uniqueness theorem/Identity theorem.
- Various kinds of singularities of complex valued functions in the extended complex plane, removable singularity, pole, essential singularity, Casorati-Weierstrass theorem concerning the nature of a function having an essential singularity, singularities of entire functions at infinity.
- Residue calculus : Residue theorem and its applications, Residue theorem for the extended complex plane.

Group B : Measure Theory - I [Marks : 35] [28 classes]

- Extended real number system $\mathbb{R}^*$ $\Big(\equiv \mathbb{R} \cup \{\infty, -\infty\}\Big)$, arithmetic operations on $\mathbb{R}^*$, linear order on $\mathbb{R}^*$.
- Motivation for the Theory of Lebesgue integration : limitations of Riemann integration, necessity of extending the concept of length of an interval to an arbitrary set; Lebesgue outer measure (m^*), properties of m^* : monotonicity, $m^*(I)$ is the length of I for any interval I, translation invariance property of m^*, countable subadditivity of m^*, m^* is not additive even for two disjoint sets. σ-algebra, Borel σ-algebra, Borel sets, example of Borel sets, additivity of m^* if one of the sets is open, additivity of m^* if one of the sets is closed, approximation of Borel sets from below by closed sets, additivity of m^* if one of the sets is a Borel set, existence of a subset of $\mathbb{R}$ that is not a Borel set, m^* is countably additive on Borel sets. Definition of Lebesgue measurable set : A set $A \subseteq \mathbb{R}$ is called *Lebesgue measurable* if there exists a Borel set $B \subseteq A$ such that $m^*(A \setminus B) = 0$, m^* is countably additive on Lebesgue measurable sets, the set of all Lebesgue measurable sets form a σ-algebra, any set $A \subset \mathbb{R}$ with $m^*(A) = 0$ is Lebesgue measurable; characterisation of Lebesgue measurable sets by open sets, closed sets, F_σ-sets, G_δ-sets; a set $A \subseteq \mathbb{R}$ is Lebesgue measurable if and only if for any set $E \subseteq \mathbb{R}$ we have $m^*(E) = m^*(E \cap A) + m^*(E \setminus A)$ [Carathéodory's criterion], non-measurable sets, Cantor set and its properties.

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4-yr Credit Distribution | MDC Credit Distribution | Course Overview

Major | Minor | MDC | Question Pattern

Generalised functions, Integral transforms & Integral Equations

Semester : VII	Paper Code : MTHM-DSCC 18-TH
Credit : 4	Full Marks : 100 (Theory : 75 & Tutorial : 25)
Minimum number of classes required : 60	

4-yr Credit Distribution | MDC Credit Distribution | Course Overview

Major | Minor | MDC | Question Pattern

Course Outcome

CO1 :

Group A : Generalised Functions [Marks : 15] [12 classes]

- Introduction and notations, Test functions, Linear functional, Space of Generalised functions, Completeness of Generalised functions, Support of a Generalised Function, Regular Generalised functions, Singular Generalised Function, The Dirac Delta function, Support of a Delta function, and Delta sequences. Change of variables in Generalised function, Multiplication of Generalised Function, Sochozki formula, Derivative of a Generalised function, Anti-derivative of a Generalised Function and examples.

Group B : Integral Transforms [Marks : 35] [28 classes]

- **Fourier Transform :** Definition and Algebraic properties of Fourier transform, Convolution, Translation, Modulation, Analytical properties of Fourier transforms, Transform of derivatives and derivatives of transform, Perseval formula, Inversion theorem, Application to solving ordinary differential equations.
- **Laplace Transforms :** Definition and Algebraic properties of Laplace transform, Transform of derivatives and derivatives of transform, Convolution, The inversion theorem and its application to find inverse of Laplace Transform, Application to solving ordinary differential equations.

Group C : Integral Equations [Marks : 25] [20 classes]

- Reduction of boundary value problem of an ordinary differential equation to an integral equation. Fredholm equation: Solution by the method of successive approximation. Neumann series. Existence and uniqueness of the solution of Fredholm equation. Equations with degenerate kernel. Eigen values and eigen solutions. Volterra equation: Solution by the method of iterated kernel, existence and uniqueness of solution. Solution of Abel equation. Solution of Volterra equation of convolution type by Laplace transform.

References

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4-yr Credit Distribution | MDC Credit Distribution | Course Overview

Major | Minor | MDC | Question Pattern

Topology - I

Semester : VII	Paper Code : MTHM-DSCC 19-TH
Credit : 4	Full Marks : 100 (Theory : 75 & Tutorial : 25)
Minimum number of classes required : 60	

4-yr Credit Distribution | MDC Credit Distribution | Course Overview

Major | Minor | MDC | Question Pattern

Course Outcome

CO1 :

- **Basi Concepts :** Definition and examples of topological spaces. Metric space as a topological space. Closed sets, closure, dense subsets. Neighbourhood, interior, exterior, boundary, accumulation point, derived set. Bases and subbases. Subspace topology. Finite product of topological spaces. Alternative methods for defining a topology in terms of Kuratowski closure operator and neighbourhood system.
- **Countability Axioms :** First and second countability, separability and Lindelöf property. Every metric space is first countable. Equivalence of second countability, separability and Lindelöf property in metric spaces.
- **Continuous functions :** Definition and examples. Simple properties and characterizations of continuous functions. Pasting lemma for continuous functions. Heine's continuity criterion for first countable topological spaces. Open map, closed map and homeomorphism, topological invariants.
- **Separation Axioms :** T_i-property $(i = 0, 1, 2, 3, 3\frac{1}{2}, 4, 5)$, regularity, complete regularity, normality and complete normality, basic properties of separation axioms, characterizations of T_1, T_2, regularity and normality, Urysohn's lemma (statement only), Tietze's extension theorem (statement only). T_5-property of a metric space.
- **Compactness :** Characterizations and basic properties, Alexander subbase theorem (statement only) and its application, compactness and finite intersection property, compactness and separation axioms. Every compact Hausdorff space without isolated point is uncountable. Compactness and continuous functions. Product of two compact spaces is compact. Countably compact, sequentially compact, Frechet compact, pseudo compact and their equivalence in metric spaces.

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4-yr Credit Distribution | MDC Credit Distribution | Course Overview

Major | Minor | MDC | Question Pattern

Functional Analysis - I

Semester : VII Credit : 4	Paper Code : MTHM-DSCC 20-TH Full Marks : 100 (Theory : 75 & Tutorial : 25)
Minimum number of classes required : 60	

4-yr Credit Distribution | MDC Credit Distribution | Course Overview

Major | Minor | MDC | Question Pattern

Course Outcome

CO1 :

- **Cardinal Number :** Concept of Cardinal number of an infinite set, Cardinality of $\mathbb{N}\ (=\aleph_0), \mathbb{Z}, \mathbb{Q}, \mathbb{R}\ (=c), \mathbb{C}$, order relation of Cardinal numbers, Schröder-Bernstein theorem.
- Concept of infinite basis of a linear space (or vector space), every linear space has a basis (statement only), cardinality of any two bases of a linear space are same (statement only), *dimension* defined as the cardinal number of a basis of a linear space.
- Normed linear space (n.l.sp.), every n.l.sp. is a metric space and hence a topological space, norm function is continuous, examples of n.l.sp. : finite dimensional spaces $\mathbb{R}^n, \mathbb{C}^n$ etc., $P[a,b]$, ℓ^∞, c, c_0, c_{00}, $\ell^p\ (p \geq 1)$, the space $C[a,b]$ of all continuous functions on $[a,b]$ with supremum norm, the space $R[a,b]$ of all Riemann integrable functions on $[a,b]$ with Riemann integral norm, Banach space, quotient space, convexity of open and closed balls, a n.l.sp. is complete if and only if every absolutely convergent series is convergent.
- Bounded linear transformation between two n.l.spaces, its equivalence with continuity, norm of a bounded linear transformation, various formulae for calculating norm of a bounded linear transformation, space of bounded linear transformations, equivalence of two norms in a linear space, isometric isomorphism and topological isomorphism (i.e. isomorphism and homeomorphism) between two n.l.spaces. Every finite dimensional n.l.sp. is a Banach space, equivalence of any two norms in a finite dimensional linear space, every n-dimensional n.l.sp. is topologically isomorphic with the n-dimensional Euclidean space, every linear transformation is bounded on a finite dimensional n.l.sp. Riesz lemma, a closed bounded set A in a n.l.sp. X is compact if and only if X is finite dimensional.
- Bounded linear functional and its example, a functional f on a n.l.sp. X is bounded if and only if $\ker f$ is closed in X, formula for calculating $\|f\|$ of a bounded linear functional f on a normed linear space, construction of unbounded linear functional on every infinite dimensional linear space, Hahn-Banach theorem (extension form only) and its consequences, dual and 2nd dual of a n.l.sp., dual space of any n.l.sp. is a Banach space, every n.l.sp. can be embedded isometrically and isomorphically into its 2nd dual space, definition of reflexivity of a n.l.sp. Dual spaces of $\mathbb{R}^n, \ell^p\ (p \geq 1), c, c_0, c_{00}$.

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4-yr Credit Distribution | MDC Credit Distribution | Course Overview

Major | Minor | MDC | Question Pattern

MTHM-DSCC 16-TH	Group Theory III & Linear Algebra - II
Group A : **Group Theory III** (Marks : 35)	(a) Short answer type questions: 5 questions are to be attempted out of 8 questions each carrying 2 marks. (b) Long answer type questions: 5 questions are to be attempted out of 8 questions each carrying 5 marks Each question may have multiple parts.
Group B : **Linear Algebra II** (Marks : 40)	(a) Short answer type questions: 5 questions are to be attempted out of 8 questions each carrying 2 marks. (b) Long answer type questions: 6 questions are to be attempted out of 10 questions each carrying 5 marks. Each question may have multiple parts.
MTHM-DSCC 17-TH	**Complex Analysis II and Measure Theory I**
Group A : **Complex Analysis II** (Marks : 40)	(a) Short answer type questions: 5 questions are to be attempted out of 8 questions each carrying 2 marks. (b) Long answer type questions: 6 questions are to be attempted out of 10 questions each carrying 5 marks Each question may have multiple parts.
Group B : **Measure Theory I** (Marks : 35)	(a) Short answer type questions: 5 questions are to be attempted out of 8 questions each carrying 2 marks. (b) Long answer type questions: 5 questions are to be attempted out of 8 questions each carrying 5 marks Each question may have multiple parts.
MTHM-DSCC 18-TH	**Generalized Functions, Integral Transforms & Integral Equation**
Group A : **Integral Transforms** (Marks : 35)	7 questions are to be attempted out of 11 questions each carrying 5 marks. Each question may have further parts. From each of the integral transforms at least five questions should be set.
Group B : **Integral Equations** (Marks : 25)	5 questions are to be attempted out of 8 questions each carrying 5 marks. Each question may have further parts.
Group C : **Generalized Functions** (Marks : 15)	3 questions are to be attempted out of 6 questions each carrying 5 marks. Each question may have further parts.
MTHM-DSCC 19-TH	**Topology I**
(Marks : 75)	(a) 7 questions are to be attempted out of 10 questions each carrying 5 marks. Each question may have multiple parts. (b) 5 questions are to be attempted out of 8 questions each carrying 8 marks Each question may have multiple parts.

MTHM-DSCC 20-TH	**Functional Analysis I**
(Marks : 75)	(a) 7 questions are to be attempted out of 10 questions each carrying 5 marks. Each question may have multiple parts. (b) 5 questions are to be attempted out of 8 questions each carrying 8 marks Each question may have multiple parts.
MTHM-DSCC 21-TH	**Ordinary Differential Equations-II & Partial Differential Equations-II**
Group A: Ordinary Differential Equations (Marks: 45)	(a) 5 questions are to be attempted out of 8 questions each carrying 5 marks. These questions will be set from the topics Qualitative Analysis of One-dimensional Continuous Systems, One-dimensional Bifurcations and Systems of Differential Equations. Each question may have multiple parts. (b) 2 questions are to be attempted out of 4 questions each carrying 10 marks These questions will be set from the topics Series Solution and Special Functions and Sturm–Liouville Problems and Eigen function Expansions. Each question may have further parts.
Group-B : Partial Differential Equations (Marks : 30)	5 questions are to be attempted out of 8 questions each carrying 6 marks. Each question may have further parts.
MTHM-DSCC 22-TH	**Graph Theory**
(Marks : 75)	(a) 7 questions are to be attempted out of 10 questions each carrying 5 marks. Each question may have multiple parts. (b) 5 questions are to be attempted out of 8 questions each carrying 8 marks. Each question may have multiple parts.
MTHM-DSCC 23.1-TH	**Mechanics-III**
Group A: Classical Mechanics (Marks : 60)	(a) 5 questions are to be attempted out of 8 questions each carrying 6 marks. These will be set from the topics mentioned in the syllabus starting from 'Mechanics of a system of particles...' to '...Statement of Noether's theorem with some illustrations' (b) 5 questions are to be attempted out of 8 questions each carrying 6 marks. These will be set from the topics mentioned in the syllabus istarting from 'Hamiltonian and Hamiltonian equations...' to '...Generating function; Poisson Bracket; Equations of motion'. Each question may have further parts.
Group B: Continuum Mechanics (Marks : 15)	3 questions are to be attempted out of 6 questions each carrying 5 marks. Each question may have further parts.
MTHM-DSCC 23.2-TH	**Measure Theory-II**
(Marks : 75)	(a) 7 questions are to be attempted out of 10 questions each carrying 5 marks . Each question may have multiple parts. (b) 5 questions are to be attempted out of 8 questions each carrying 8 marks. Each question may have multiple parts.