

**Scheme of Examination
&
Detailed Syllabus**

**Master of Science
(M.Sc. Mathematics)**



AISECT UNIVERSITY

Matwari Chowk, In front of Gandhi Maidan,
Hazaribagh (Jharkhand)-825301

Contact us: 8252299990, Visit us: aisectuniversityjharkhand.ac.in, mail us:
info@aisectuniversityjharkhand.ac.in

AISECT University, Hazaribag (JH)

| Course Structure | | | | | | | | | | |
|---|----------------------------|----------|------------------------|-------|----------------|------------|-------------|-------|-------------------|---------------|
| M.Sc. Mathematics (Ist Semester) | | | | | | | | | | |
| Subject Code | Subject Name | Credits | Maximum marks Allotted | | | | | | Duration of Exam. | |
| | | | Theory | | | Practical | | Total | Theo ry | Practi cal |
| | | | Major | Minor | Sessio nal. | End Sem | Lab Work | | | |
| SMMA101 | Advance Abstract Algebra-I | 4(3+1+0) | 50 | 20 | 30 | - | - | 100 | 3 hr | - |
| SMMA102 | Real Analysis-I | 4(3+1+0) | 50 | 20 | 30 | - | - | 100 | 3 hr | - |
| SMMA103 | Topology-I | 4(3+1+0) | 50 | 20 | 30 | - | - | 100 | 3 hr | - |
| SMMA104 | Complex Analysis-I | 4(3+1+0) | 50 | 20 | 30 | - | - | 100 | 3 hr | - |

COURSE STRUCTURE OF MSCIT II SEMESTER

| Subject Details | | | Main Examinations | | | | Sessional *** | | Credit Distributi on | | | Alotted Credits |
|------------------------|---|--------------------|-------------------|------------------|------------------|------------------|------------------|------------------|----------------------------|---|---|-------------------------------------|
| Subject Code | Subject Name | Total Mar ks | Major | | Minor | | Max Mar ks | Min Mar ks | L | T | P | Subject wise Distribu tion |
| | | | Max Mar ks | Min Mar ks | Max Mar ks | Min Mar ks | | | | | | |
| SMMA 201 | Advance abstract Algebra-II | 100 | 50 | 17 | 20 | 7 | 30 | 12 | 3 | 1 | 0 | 4 |
| SMMA 202 | Real Analysis-II | 100 | 50 | 17 | 20 | 7 | 30 | 12 | 3 | 1 | 0 | 4 |
| SMMA 203 | Topology -II | 100 | 50 | 17 | 20 | 7 | 30 | 12 | 3 | 1 | 0 | 4 |
| SMMA 204 | Complex Analysis-II | 100 | 50 | 17 | 20 | 7 | 30 | 12 | 3 | 1 | 0 | 4 |
| SMGT 802 | Entrepreneur ship Developmen t | 50 | 25 | 17 | 10 | 4 | 15 | 6 | 1 | | - | 1 |
| Practical Group | | | | | | | | | | | | |
| SMGT 802 | Entrepreneur ship Developmen t | 100 | 50 | 17 | | | 50 | 17 | - | - | 2 | 2 |

AISECT University, Hazaribag (JH)

| Course Structure | | | | | | | | | | |
|---|------------------------------|----------|------------------------|-------|------------|-----------|----------|-------|-------------------|-----------|
| M.Sc. Mathematics (Ist Semester) | | | | | | | | | | |
| Subject Code | Subject Name | Credits | Maximum marks Allotted | | | | | | Duration of Exam. | |
| | | | Theory | | | Practical | | Total | Theory | Practical |
| | | | Major | Minor | Sessional. | End Sem | Lab Work | | | |
| SMMA301 | Functional Analysis-I | 4(3+1+0) | 50 | 20 | 30 | - | - | 100 | 3 hr | - |
| SMMA 302 | Integral Transform-I | 4(3+1+0) | 50 | 20 | 30 | - | - | 100 | 3 hr | - |
| SMMA 303 | Special Function-I | 4(3+1+0) | 50 | 20 | 30 | - | - | 100 | 3 hr | - |
| SMMA 304 | Advance Discrete Mathematics | 4(3+1+0) | 50 | 20 | 30 | - | - | 100 | 3 hr | - |

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| Course Structure | | | | | | | | | | |
|---|------------------------|----------|------------------------|-------|------------|-----------|----------|-------|-------------------|-----------|
| M.Sc. Mathematics (Ist Semester) | | | | | | | | | | |
| Subject Code | Subject Name | Credits | Maximum marks Allotted | | | | | | Duration of Exam. | |
| | | | Theory | | | Practical | | Total | Theory | Practical |
| | | | Major | Minor | Sessional. | End Sem | Lab Work | | | |
| SMMA 401 | Functional Analysis-II | 4(3+1+0) | 50 | 20 | 30 | - | - | 100 | 3 hr | - |
| SMMA 402 | Integral Transform-II | 4(3+1+0) | 50 | 20 | 30 | - | - | 100 | 3 hr | - |
| SMMA 403 | Special Function-II | 4(3+1+0) | 50 | 20 | 30 | - | - | 100 | 3 hr | - |
| SMMA 404 | Operation Research | 4(3+1+0) | 50 | 20 | 30 | - | - | 100 | 3 hr | - |

AISECT UNIVERSITY, Hazaribag (JH)

Scheme of Examination

Department: Mathematics

| Subject Code | Subject Name | Credits | Maximum marks Allotted | | | | | Duration of Exam. | | |
|--------------|----------------------------|----------|------------------------|-------|------------|-----------|----------|-------------------|--------|-----------|
| | | | Theory | | | Practical | | Total | Theory | Practical |
| | | | Major | Minor | Sessional. | End Sem | Lab Work | | | |
| SMMA101 | Advance Abstract Algebra-I | 4(3+1+0) | 50 | 20 | 30 | - | - | 100 | 3 hr | - |

Pattern:

The question paper will consist of six questions. Question no. 1 will have 10 objective type questions of 10 marks, covering entire syllabus. Objective questions should have right mix of questions to test the logic, problem solving skill and reasoning. Each objective question should have four choices to pick up from. Remaining five questions will carry 08 marks each, one from each of the five units of the syllabus and may have internal choice. These five questions will have two parts A & B, preferably one theoretical and other numerical. Questions should test the concepts, knowledge and application. Candidates are required to answer all the questions.

OBJECTIVE

- Explain the method of application of Normal and subnormal series
- Explain the method of application of Solvable and Nilpotent group
- Explain the method of application of Algebraic extensions
- Explain the method of application of class equation of finite group
- Explain the method of application of Polynomial Ring $R[x]$

Syllabus

Unit-1:

Normal and subnormal series of group, composition series of group, Jordan- holder theorem.

Unit-2:

Solvable and Nilpotent groups,

Unit-3:

Field & subfield definition & Examples, Extension fields, Algebraic extensions, Separable and Inseparable extensions Normal extension, Perfect fields

Unit-4:

Class equation of finite group, Cauchy's theorem for finite groups, Sylow Theorem, Wilson's Theorem, Lagrange's Theorem.

Unit-5:

Polynomial Ring $R[x]$ over a Ring R in an indeterminate X , Primitive polynomial .The ring of Gaussian integers as an Euclidean domain, Fermat's Theorem, Unique Factorization domain.

Outcome

- To be able to understand the method of application of Normal and subnormal series
- To be able to understand the method of application of Solvable and Nilpotent group
- To be able to understand the method of application of Algebraic extensions
- To be able to understand the method of application of class equation of finite group
- To be able to understand the method of application of Polynomial Ring $R[x]$

Recommended text:-

1. S. K. Jain, P. B. Bhattacharya and S. R. Nagpaul, Basic Abstract Algebra, Cambridge University Press (1997).
 2. I. N. Herstein, Topics in algebra , wiley Eastern, New Delhi
 3. Modern Algebra, by A. R. Vashista, Krishna Prakashan Merrut
 4. Advanced Abstract Algebra ; Dr. H.K. Pathak ; Shiksha Sahitya Prakashan, Meerut
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Department: Mathematics

| Subject Code | Subject Name | Credits | Maximum marks Allotted | | | | | Duration of Exam. | | |
|--------------|-----------------|----------|------------------------|-------|------------|-----------|----------|-------------------|--------|-----------|
| | | | Theory | | | Practical | | Total | Theory | Practical |
| | | | Major | Minor | Sessional. | End Sem | Lab Work | | | |
| SMMA102 | Real Analysis-I | 4(3+1+0) | 50 | 20 | 30 | - | - | 100 | 3 hr | - |

Pattern:

The question paper will consist of six questions. Question no. 1 will have 10 objective type questions of 10 marks, covering entire syllabus. Objective questions should have right mix of questions to test the logic, problem solving skill and reasoning. Each objective question should have four choices to pick up from. Remaining five questions will carry 08 marks each, one from each of the five units of the syllabus and may have internal choice. These five questions will have two parts A & B, preferably one theoretical and other numerical. Questions should test the concepts, knowledge and application. Candidates are required to answer all the questions.

Objective

Explain the method of application Sequence & Subsequences

Explain the method of application of Series of Non-negative terms

Explain the method of application of General Principal of convergence

Explain the method of application of Neighbourhoods, open set and closed set

Explain the method of application of Limit and continuity

Syllabus

Unit-1: Sequences & subsequences, Convergent sequence, divergent sequence and some theorems, Real Valued function & Theorems, Cesaros's Theorem, Nested Interval theorem, Limit superior and Limit Inferior.

Unit-2: Series of Non-negative terms, comparison test, cauchy's condensation test, comparison of ratios, Logarithmic test, D'morgan and bertrand's test.

Unit-3: General Principal of convergence, pringsheims Method, Merten's Theorem, Abel's Theorem, Euler's constant Theorem.

Unit-4: Neighbourhoods, open set and closed set & properties, Bolzano-weierstranss Theorem, Baire category theorem for R, covering Theorem.

Unit-5: Limit and continuity Theorems on continuity, Bolzano's theorem on continuity, continuity of inverse function, Geometrical meaning of a derivative, chain Rule of Derivative, Darboux Theorem and cauchy's mean value Theorems

Outcome

To be able to understand the method of application Sequence & Subsequences

To be able to understand the method of application of Series of Non-negative terms

To be able to understand the method of application of General Principle of convergence
To be able to understand the method of application of Neighbourhoods, open set and closed set
To be able to understand the method of application of Limit and continuity

Recommended text:-

1. Real Analysis, J. N. Sharma and A. R. Vasishtha, Krishna Prakashan media (P) Ltd. Meerut Delhi.
2. Real Analysis, H. K. Pathak, Shiksha Sahitya prakashan.

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AISECT UNIVERSITY, Hazaribag (JH)
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Department: Mathematics

| Subject Code | Subject Name | Credits | Maximum marks Allotted | | | | | Duration of Exam. | | |
|--------------|--------------|----------|------------------------|-------|------------|-----------|----------|-------------------|--------|-----------|
| | | | Theory | | | Practical | | Total | Theory | Practical |
| | | | Major | Minor | Sessional. | End Sem | Lab Work | | | |
| SMMA103 | Topology-I | 4(3+1+0) | 50 | 20 | 30 | - | - | 100 | 3 hr | - |

Pattern:

The question paper will consist of six questions. Question no. 1 will have 10 objective type questions of 10 marks, covering entire syllabus. Objective questions should have right mix of questions to test the logic, problem solving skill and reasoning. Each objective question should have four choices to pick up from. Remaining five questions will carry 08 marks each, one from each of the five units of the syllabus and may have internal choice. These five questions will have two parts A & B, preferably one theoretical and other numerical. Questions should test the concepts, knowledge and application. Candidates are required to answer all the questions.

Objective

Explain the method of application topological space

Explain the method of application of Neighborhoods, Interiors, exteriors and boundary

Explain the method of application of Continuous Maps

Explain the method of application of Connected space and disconnected spaces

Explain the method of application of compactness, compact subspace

Syllabus

Unit-1: Definition and examples of topological space, Open sets, Closed sets , Closure , Dense subsets.

Unit-2: Neighborhoods, Interiors, exteriors and boundary .Accumulation point and derived sets, bases and sub-bases, subspaces and relative topology.

Unit-3: Continuous Maps, Continuous Maps into \mathbb{R} , open and closed maps, Homeomorphism, Finite product spaces, projection maps.

Unit-4: Connected space and disconnected spaces, separated sets, component, locally connected space, Path connectedness, separation axioms : T_0 , T_1 and T_2 Spaces.

Unit-5: Introduction of compactness, compact subspace, Finite intersection property, Bolzano-weierstrass property, countable, sequential and local compactness.

Outcome

To be able to understand the method of application topological space

To be able to understand the method of application of Neighborhoods, Interiors, exteriors and boundary

To be able to understand the method of application of Continuous Maps

To be able to understand the method of application of Connected space and disconnected spaces

To be able to understand the method of application of compactness, compact subspace

Recommended Text Books :

1. Introduction to topology and modern analysis by G.F. Simmons , McGraw hill.

2. Introduction to general topology by K. D. Joshi, wiley eastern

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| Subject Code | Subject Name | Credits | Maximum marks Allotted | | | | | Duration of Exam. | | |
|--------------|--------------------|----------|------------------------|-------|------------|-----------|----------|-------------------|--------|-----------|
| | | | Theory | | | Practical | | Total | Theory | Practical |
| | | | Major | Minor | Sessional. | End Sem | Lab Work | | | |
| SMMA104 | Complex Analysis-I | 4(3+1+0) | 50 | 20 | 30 | - | - | 100 | 3 hr | - |

Pattern:

The question paper will consist of six questions. Question no. 1 will have 10 objective type questions of 10 marks, covering entire syllabus. Objective questions should have right mix of questions to test the logic, problem solving skill and reasoning. Each objective question should have four choices to pick up from. Remaining five questions will carry 08 marks each, one from each of the five units of the syllabus and may have internal choice. These five questions will have two parts A & B, preferably one theoretical and other numerical. Questions should test the concepts, knowledge and application. Candidates are required to answer all the questions.

Objective

Explain the method of application Complex Number

Explain the method of application of Conformal mappings

Explain the method of application of Complex integration

Explain the method of application of Cauchy integral formula

Explain the method of application of Taylor's Theorem, Laurent's Theorem

Syllabus

Unit-I: Complex Number, Analytic Functions, Cauchy – Riemann Equations, Harmonic Functions, Conjugate functions.

Unit-II: Conformal mappings, Bi-linear transformations, Geometrical interpretations of the transformations $\omega = z+\alpha$, $\omega = \beta z$, $\omega = \gamma z$. Bilinear transformation of a circle.

Unit-III: Complex integration, complex integrals as sum of two real line integrals, Cauchy's Theorem, Extension of Cauchy's Theorem to multi – connected region Cauchy.

Unit-IV: Cauchy integral formula, Extension of cauchy's integral formula to multiconnected regions, Liouville's Theorem, Morea's theorem.

Unit-V: Taylor's Theorem, Laurent's Theorem with examples.

Outcome

To be able to understand the method of application Complex Number

To be able to understand the method of application of Conformal mapping

To be able to understand the method of application of Complex integration

To be able to understand the method of application of Cauchy integral formula

To be able to understand the method of application of Taylor's Theorem, Laurent's Theorem

Recommended Text:

1. Functions of a complex variable, By B. S. Tyagi, Kedarnath, Ramnath, Delhi.
 2. Functions of a complex variable, B. Conway, Springer.
 3. Complex Analysis, T. O. Moore & E. H. Hadlock, Alliel Pub.
 4. Complex Functions, J. N. Sharma, Krishna pub.
 5. Complex Variable, schaum's outline
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Department: Mathematics

| Subject Code | Subject Name | Credits | Maximum marks Allotted | | | | | Duration of Exam. | | |
|--------------|-----------------------------|----------|------------------------|-------|------------|-----------|----------|-------------------|--------|-----------|
| | | | Theory | | | Practical | | Total | Theory | Practical |
| | | | Major | Minor | Sessional. | End Sem | Lab Work | | | |
| SMMA201 | Advance abstract Algebra-II | 4(3+1+0) | 50 | 20 | 30 | - | - | 100 | 3 hr | - |

Pattern:

The question paper will consist of six questions. Question no. 1 will have 10 objective type questions of 10 marks, covering entire syllabus. Objective questions should have right mix of questions to test the logic, problem solving skill and reasoning. Each objective question should have four choices to pick up from. Remaining five questions will carry 08 marks each, one from each of the five units of the syllabus and may have internal choice. These five questions will have two parts A & B, preferably one theoretical and other numerical. Questions should test the concepts, knowledge and application. Candidates are required to answer all the questions.

Objective

Explain the method of application modules

Explain the method of application of Finite generate modules

Explain the method of application of Simple modules

Explain the method of application of Schroeder- Bernstion Theorem, Hillebert basic Theorem, Wedderburn - Artin Theorem,

Explain the method of application of Uniform modules

Syllabus

Unit-1: Introduction to modules- Examples, sub modules, quotient modules. Module homomorphism, isomorphism.

Unit-2; Finite generate modules, Fundamental structure theorem for finitely generated moduls over a principal ideal domain its application of finitely generated abelian group. cyclic modules.

Unit-3: Simple modules, semi simple modules, free modules, Schurs lemma. Neotherian & artinian modules and ring

Unit-4: Schroeder- Bernstion Theorem, Hillebert basic Theorem, Wedderburn - Artin Theorem,

Unit-5: Uniform modules, primary modules, Noether - Laskar Theorem. Fundamental structure theorem of module over a principle ideal domain and its application to finitely generated abelian groups.

Outcome

To be able to understand the method of application modules

To be able to understand the method of application of Finite generate modules

To be able to understand the method of application of Simple modules

To be able to understand the method of application of Schroeder- Bernstion Theorem, Hillebert basic Theorem, Wedderburn - Artin Theorem,

To be able to understand the method of application of Uniform modules

Recommended text :-

1. S. K. Jain, P. B. Bhattacharya and S. R. Nagpaul, Basic Abstract Algebra, Cambridge University Press (1997).

2. I. N. Herstein, Topics in algebra , wiley Eastern, New Delhi

3. Modern Algebra, by A. R. Vashista, Krishna Prakashan Merrut

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Department: Mathematics

| Subject Code | Subject Name | Credits | Maximum marks Allotted | | | | | Duration of Exam. | | |
|--------------|------------------|----------|------------------------|-------|------------|-----------|----------|-------------------|--------|-----------|
| | | | Theory | | | Practical | | Total | Theory | Practical |
| | | | Major | Minor | Sessional. | End Sem | Lab Work | | | |
| SMMA202 | Real Analysis-II | 4(3+1+0) | 50 | 20 | 30 | - | - | 100 | 3 hr | - |

Pattern:

The question paper will consist of six questions. Question no. 1 will have 10 objective type questions of 10 marks, covering entire syllabus. Objective questions should have right mix of questions to test the logic, problem solving skill and reasoning. Each objective question should have four choices to pick up from. Remaining five questions will carry 08 marks each, one from each of the five units of the syllabus and may have internal choice. These five questions will have two parts A & B, preferably one theoretical and other numerical. Questions should test the concepts, knowledge and application. Candidates are required to answer all the questions.

Objective

- Explain the method of application Riemann-Stieltjes Integral & theorems
- Explain the method of application of Relation between R- Integral & Rs-Integral
- Explain the method of application of Continuity of function of two variables
- Explain the method of application of Differentiation of vector-valued function
- Explain the method of application of Jacobians

Syllabus

- Unit-1:** Definition of Riemann-Stieltjes Integral & theorems, The Rs-Integral as limit of sums, Some classes of Rs-Integrable function, Algebra of Rs-Integrable function, The Interval of integration, The Rs-Integrability of composite function.
- Unit-2:** Relation between R- Integral & Rs-Integral, Integration of vector valued function, some more Theorems on integration.
- Unit-3:** Continuity of function of two variables, Partial Derivatives, Differentiability of two variables, Differentiability of composite function.
- Unit-4:** Differentiation, Differentiation of vector-valued function, Differentiation in R_n , The implicit function Theorem.
- Unit-5:** Definition of Jacobians', Case of function of function, Jacobian of implicit functions, Necessary and Sufficient condition for a Jacobian to Vanish Identically.

Outcome

To be able to understand the method of application Riemann-Stieltjes Integral & theorems

To be able to understand the method of application of Relation between R- Integral & R_s-Integral

To be able to understand the method of application of Continuity of function of two variables

To be able to understand the method of application of Differentiation of vector-valued function

To be able to understand the method of application of Jacobians

Recommended text:

1. Walter Rudin, Principles of mathematical analysis, McGraw Hill.

2. Real Analysis, J. N. Sharma and A. R. Vasishtha, Krishna Prakashan media (P) Ltd.
Meerut Delhi.

3. Real Analysis, H. K. Pathak, Shiksha Sahitya Prakashan.

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Department: Mathematics

| Subject Code | Subject Name | Credits | Maximum marks Allotted | | | | | Duration of Exam. | | |
|-----------------|---------------------|----------|------------------------|-------|------------|-----------|----------|-------------------|--------|-----------|
| | | | Theory | | | Practical | | Total | Theory | Practical |
| | | | Major | Minor | Sessional. | End Sem | Lab Work | | | |
| SMMA 203 | Topology –II | 4(3+1+0) | 50 | 20 | 30 | - | - | 100 | 3 hr | - |

Pattern:

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Objective

Explain the method of application of Separation Axioms

Explain the method of application of Countability Axioms

Explain the method of application of Convergence in Topology

Explain the method of application of Metric Spaces and Metrizable

Explain the method of application of Product Spaces

Syllabus

Unit-1: Separation Axioms: Regular and T_3 spaces, normal and T_4 spaces, Urysohn's Lemma, Tietze's, Extension theorem, completely regular and Tychonoff spaces, completely normal and T_5 spaces.

Unit-2: Countability Axioms: First and second axioms of countability, Lindelof spaces, Separable spaces, Countably compact spaces, Limit point compact spaces.

Unit-3: Convergence in Topology: Sequences and subsequences, convergence in topology, sequential compactness, local compactness, one point compactification, Stone-Cech compactification.

Unit-4: Metric Spaces and Metrizable: Separation and countability axioms in metric spaces, convergence in metric spaces, complete metric spaces.

Unit-5: Product Spaces: Arbitrary product spaces, product invariance of certain separation and countability axioms, Tychonoff's Theorem, product invariance of connectedness.

Outcome

To be able to understand the method of application of Separation Axioms

To be able to understand the method of application of Countability Axioms

To be able to understand the method of application of Convergence in Topology

To be able to understand the method of application of Metric Spaces and Metrizability

To be able to understand the method of application of Product Spaces

Recommended Text Books:

1. Introduction to topology and modern analysis by G.F. Simmons , McGraw hill.
2. Introduction to general topology by K. D. Joshi, wiley eastern

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| Subject Code | Subject Name | Credits | Maximum marks Allotted | | | | | Duration of Exam. | | |
|--------------|---------------------|----------|------------------------|-------|------------|-----------|----------|-------------------|--------|-----------|
| | | | Theory | | | Practical | | Total | Theory | Practical |
| | | | Major | Minor | Sessional. | End Sem | Lab Work | | | |
| SMMA204 | Complex Analysis-II | 4(3+1+0) | 50 | 20 | 30 | - | - | 100 | 3 hr | - |

Pattern:

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Objective

Explain the method of application of Fundamental theorem of integral calculus for complex functions

Explain the method of application of Residues

Explain the method of application of Evaluation of the integral

Explain the method of application of Fixed points or Invariant points of a Bilinear transformation

Explain the method of application of Analytic, Holomorphic and Regular function

Syllabus

Unit-1: Fundamental theorem of integral calculus for complex functions, uniqueness theorem, The zero of an analytic function, Singularities of an analytic function.

Unit-2: Residues, Cauchy's residue theorem, Evaluation of real definite integrals by contour integration, Integration round the unit circle.

Unit-3: Evaluation of the integral . Evaluation of the integrals of the form , , $m > 0$, where $P(x), Q(x)$ are polynomials, $\deg Q(x) > \deg P(x)$ $Q(x) = 0$ has no real roots.

Unit-4: Fixed points or Invariant points of a Bilinear transformation, Normal form of a Bilinear transformation, Elliptic, Hyperbolic and parabolic transformations, some special Bilinear transformations.

Unit-5: Analytic, Holomorphic and Regular function, Polar form of Cauchy-Riemann Equations, Derivative of $w = f(z)$ in polar form, orthogonal System, Multiple Valued function.

Outcome

To be able to understand the method of application of Fundamental theorem of integral calculus for complex functions

To be able to understand the method of application of Residues

To be able to understand the method of application of Evaluation of the integral

To be able to understand the method of application of Fixed points or Invariant points of a Bilinear transformation

To be able to understand the method of application of Analytic, Holomorphic and Regular function

Recommended text:

1. John B. Conway, Functions of one complex variable (second edition) Springer Verlag, NewYork (1973).
 2. T. O. Moore and E. H. Hadlock, Complex Analysis, Allied Publishers Ltd. (1993).
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| Subject Code | Subject Name | Credits | Maximum marks Allotted | | | | | Duration of Exam. | | |
|--------------|-----------------------|----------|------------------------|-------|------------|-----------|----------|-------------------|--------|-----------|
| | | | Theory | | | Practical | | Total | Theory | Practical |
| | | | Major | Minor | Sessional. | End Sem | Lab Work | | | |
| SMMA301 | Functional Analysis-I | 4(3+1+0) | 50 | 20 | 30 | - | - | 100 | 3 hr | - |

Pattern:

The question paper will consist of six questions. Question no. 1 will have 10 objective type questions of 10 marks, covering entire syllabus. Objective questions should have right mix of questions to test the logic, problem solving skill and reasoning. Each objective question should have four choices to pick up from. Remaining five questions will carry 08 marks each, one from each of the five units of the syllabus and may have internal choice. These five questions will have two parts A & B, preferably one theoretical and other numerical. Questions should test the concepts, knowledge and application. Candidates are required to answer all the questions.

Objective

Explain the method of application of Normed linear space, Banach spaces

Explain the method of application of Completeness of c^n

Explain the method of application of Sub space and Quotient spaces of Banach space

Explain the method of application of Compactness

Explain the method of application of The conjugate space of L_p , weak convergence

Syllabus

Unit -1: Normed linear space, Banach spaces examples and theorems, Holders inequality, Minkowski's inequality, Cauchy's inequality.

Unit -2: Completeness of c^n , the space l_p^n , completeness of l_p^n , the space l_p , Riesz – Fisher theorem.

Unit -3: Sub space and Quotient spaces of Banach space, Norm of Bounded (continuous) linear transformation, basic properties of finite dimensional normed linear space.

Unit -4: Compactness, Equivalent norms, Riesz – lemma, Convexity theorem, the natural imbedding of N in N^{**} , Reflexivity.

Unit -5: The conjugate space of l_p , weak convergence, the conjugate of an operator, dual spaces with examples, uniform boundedness theorem.

Outcome

To be able to understand the method of application of Normed linear space, Banach spaces
To be able to understand the method of application of Completeness of c^n
To be able to understand the method of application of Sub space and Quotient spaces of Banach space
To be able to understand the method of application of Compactness
To be able to understand the method of application of The conjugate space of L_p , weak convergence

Recommended Text

1. P.K. Jain ,O.P. Ahuja and Khalil Ahmad ,Functional Analysis ,New Age International (P) Limited & Wiley Eastern Ltd. New Delhi ,1997.
 2. K.K. Jha ,Functional Analysis ,Students Friends ,1986.
 3. B.Chaudhary and Sudarshan Nanda , Functional Analysis with applications ,Wiley Eastern Ltd. , 1989
 4. Functional analysis by Dr. H.K Pathak: Shiksha Sahitya Prakashan
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AISECT UNIVERSITY, Hazaribag (JH)

Scheme of Examination

Department: Mathematics

| Subject Code | Subject Name | Credits | Maximum marks Allotted | | | | | Duration of Exam. | | |
|--------------|----------------------|----------|------------------------|-------|------------|-----------|----------|-------------------|--------|-----------|
| | | | Theory | | | Practical | | Total | Theory | Practical |
| | | | Major | Minor | Sessional. | End Sem | Lab Work | | | |
| SMMA 302 | Integral Transform-I | 4(3+1+0) | 50 | 20 | 30 | - | - | 100 | 3 hr | - |

Pattern:

The question paper will consist of six questions. Question no. 1 will have 10 objective type questions of 10 marks, covering entire syllabus. Objective questions should have right mix of questions to test the logic, problem solving skill and reasoning. Each objective question should have four choices to pick up from. Remaining five questions will carry 08 marks each, one from each of the five units of the syllabus and may have internal choice. These five questions will have two parts A & B, preferably one theoretical and other numerical. Questions should test the concepts, knowledge and application. Candidates are required to answer all the questions.

Objective

- Explain the method of application of Laplace transform
- Explain the method of application of Differential Equations with Constant Coefficients
- Explain the method of application of Laplace transform in initial Boundary value problems
- Explain the method of application of Dirichlet's condition & Fourier series
- Explain the method of application of Finite Fourier sine transform

Syllabus

Unit –I: Definition and Properties .Sufficient Conditions for the existence of Laplace Transform. Laplace Transform of some elementary functions. Laplace Transform of the derivatives. Inverse of Laplace Transform. Initial and final theorems..Leach's theorem .Heaviside's expansion theorem. Convolution theorem.

Unit-II: Some of ordinary Differential Equations with Constant Coefficients. Solution of ordinary differential equation with variable coefficients. Solution of Simultaneous ordinary differential equation. Solution of Partial differential equations. Application to electrical equations .Application to mechanics. Application of Laplace transform to integral equations.

Unit-III: Application of Laplace transform in initial Boundary value problems.Heat conduction equation.Wave equation.Laplace equation Application to Beams.

Unit-IV: Dirichlet's condition. Fourier series. Fourier integral formula, Fourier transform or complex Fourier transform. Inversion theorem for complex Fourier transform. Fourier Sine and Cosine Transform.

Change of Scale Property, Shifting Property. Modulation theorem. Multiple Fourier transform. Convolution. The Convolution or folding theorem for Fourier transform. Parseval's identity for Fourier transform.

Unit-V: Finite Fourier sine transform. Inversion formula for sine transform. Finite Fourier cosine transform. Inversion formula for cosine transform. Multiple finite Fourier transform theorems on operational properties of finite sine and cosine transform. Combined properties of finite Fourier sine and cosine transform.

Outcome

To be able to understand the method of application of Laplace transform

To be able to understand the method of application of Differential Equations with Constant Coefficients

To be able to understand the method of application of Laplace transform in initial Boundary value problems

To be able to understand the method of application of Dirichlet's condition & Fourier series

To be able to understand the method of application of Finite Fourier sine transform

Recommended Text

1. I.N.Sneddon : The Uses & integral transform.
2. C.J.Tranter: Integral transform.
3. Tricomi: Integral equations.
4. Dr.ShantiSwarup :Integral transform
5. Goyal & Gupta: Integralk Transform

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AISECT UNIVERSITY, Hazaribag (JH)
Scheme of Examination

Department: Mathematics

| Subject Code | Subject Name | Credits | Maximum marks Allotted | | | | | Duration of Exam. | | |
|--------------|--------------------|----------|------------------------|-------|------------|-----------|----------|-------------------|--------|-----------|
| | | | Theory | | | Practical | | Total | Theory | Practical |
| | | | Major | Minor | Sessional. | End Sem | Lab Work | | | |
| SMMA 303 | Special Function-I | 4(3+1+0) | 50 | 20 | 30 | - | - | 100 | 3 hr | - |

Pattern:

The question paper will consist of six questions. Question no. 1 will have 10 objective type questions of 10 marks, covering entire syllabus. Objective questions should have right mix of questions to test the logic, problem solving skill and reasoning. Each objective question should have four choices to pick up from. Remaining five questions will carry 08 marks each, one from each of the five units of the syllabus and may have internal choice. These five questions will have two parts A & B, preferably one theoretical and other numerical. Questions should test the concepts, knowledge and application. Candidates are required to answer all the questions.

Objective

Explain the method of application of Special Functions, Infinite series

Explain the method of application of Hypergeometric Function

Explain the method of application of Introduction of generalized Hypergeometric Function

Explain the method of application of Integrals involving Generalized hypergeometric Functions

Explain the method of application of Generating Function for $J_n(z)$

Syllabus

UNIT – 1: Special Functions, Infinite series , ortho gonol Polynomials, eulerian definition Weistrass Defination, Eulerian Product $\Gamma(z)$ Evaluation of $\Gamma(i)$ and $\Gamma'(1/2)/\Gamma(1/2)$ Equivalence of Weierstrass and Euler Defination , Factorial Function Gauss' Multiplication Formula .

UNIT – 2: Hypergeometric Function , Integral Representation of $f(a, b ; c, z)$ Relation of contiguity , Hypergeometric differential equation , transformation of $f(a, b ; c, z)$

UNIT – 3: Introduction of generalized Hypergeometric Function , Differential Equation Satisfied by pFq , saalsechutz Theorem , whipples Theorem , Dixon's Theorems

UNIT – 4: Integrals involving Generalized hypergeometric Functions, Kummers Theorems, Ramanujans Theorems.

UNIT – 5: Generating Function for $J_n(z)$, Alternative Form of Generating Function Recurrence relation for $J_n(z)$, Bessel's integral , Spherical Bessel Functions , Neumann Polynomials & series .

Outcome

To be able to understand the method of application of Special Functions, Infinite series

To be able to understand the method of application of Hypergeometric Function

To be able to understand the method of application of Introduction of generalized Hypergeometric Function

To be able to understand the method of application of Integrals involving Generalized hypergeometric Functions

To be able to understand the method of application of Generating Function for $J_n(z)$

Recommended Text

1. J.N. Sharma , Special Function , Pragati Prakashan meerut.
2. H.K. Pathak , Special Functions, Shiksha Sahitya Prakashan.

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AISECT UNIVERSITY, Hazaribag (JH)
Scheme of Examination

Department: Mathematics

| Subject Code | Subject Name | Credits | Maximum marks Allotted | | | | | Duration of Exam. | | |
|--------------|------------------------------|----------|------------------------|-------|------------|-----------|----------|-------------------|--------|-----------|
| | | | Theory | | | Practical | | Total | Theory | Practical |
| | | | Major | Minor | Sessional. | End Sem | Lab Work | | | |
| SMMA 304 | Advance Discrete Mathematics | 4(3+1+0) | 50 | 20 | 30 | - | - | 100 | 3 hr | - |

Pattern:

The question paper will consist of six questions. Question no. 1 will have 10 objective type questions of 10 marks, covering entire syllabus. Objective questions should have right mix of questions to test the logic, problem solving skill and reasoning. Each objective question should have four choices to pick up from. Remaining five questions will carry 08 marks each, one from each of the five units of the syllabus and may have internal choice. These five questions will have two parts A & B, preferably one theoretical and other numerical. Questions should test the concepts, knowledge and application. Candidates are required to answer all the questions.

Objective

Explain the method of application of Algebraic Structures.

Explain the method of application of Semigroup & Monoids .

Explain the method of application of Lattices .

Explain the method of application of Complemented and Distributive Lattices.

Explain the method of application of Trees.

Syllabus

UNIT – 1: Algebraic Structures : Introduction , Algebraic Systems : Examples and Genral Properties : Defination and Examples , Some Simple Algebraic Systems and Genral Properties , Homomorphism and Isomorphism congruence reletion .

UNIT – 2: Semigroup & Monoids : Defination & Examples , Homomorphism of semigroups and Monoids

UNIT – 3: Lattices : Lattices as Partially ordered Sets : Defination and Examples , Principale of duality , some Properties of Lattices , Lattices as Algebraic Systems , Sublattices , Direct Product and Homomorphism.

UNIT – 4: Some special Lattices e.g. complete , Complemented and Distributive Lattices , Boolean Algebra : definition and Examples , Subalgebra , Direct product and Homomorphism , Join irreducible , atoms and antiatoms.

UNIT – 5: Trees : Trees and its properties, minimally connected graphs pendant vertices in a tree, distance and centers in a tree , rooted and binary tree Levels in a binary tree , height of a tree , Spanning tress , rank and Nullity.

Outcome

To be able to understand the method of application of Algebraic Structures.

To be able to understand the method of application of Semigroup & Monoids .

To be able to understand the method of application of Lattices .

To be able to understand the method of application of Complemented and Distributive Lattices.

To be able to understand the method of application of Trees.

Recommended Text

1. J.P. Tremblay & R. Manohar, Discrete Mathematical Structures with Applications to Computer Science , McGraw-Hill Book Co. 1997 (for units I ,II and III)
2. Dr. H.K. Pathak : Advance discrete Mathematics , Shikasha Sahitya Prakashan Meerut .

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Scheme of Examination

Department: Mathematics

| Subject Code | Subject Name | Credits | Maximum marks Allotted | | | | | Duration of Exam. | | |
|--------------|------------------------|----------|------------------------|-------|------------|-----------|----------|-------------------|--------|-----------|
| | | | Theory | | | Practical | | Total | Theory | Practical |
| | | | Major | Minor | Sessional. | End Sem | Lab Work | | | |
| SMMA 401 | Functional Analysis-II | 4(3+1+0) | 50 | 20 | 30 | - | - | 100 | 3 hr | - |

Pattern:

The question paper will consist of six questions. Question no. 1 will have 10 objective type questions of 10 marks, covering entire syllabus. Objective questions should have right mix of questions to test the logic, problem solving skill and reasoning. Each objective question should have four choices to pick up from. Remaining five questions will carry 08 marks each, one from each of the five units of the syllabus and may have internal choice. These five questions will have two parts A & B, preferably one theoretical and other numerical. Questions should test the concepts, knowledge and application. Candidates are required to answer all the questions.

Objective

Explain the method of application of Open mapping theorem ,Closed graph theorem , Hahn – Banach theorem for linear spaces

Explain the method of application of Inner product spaces

Explain the method of application of Orthogonal complements

Explain the method of application of the conjugate space H^*

Explain the method of application of the Adjoint of an Operator

Syllabus

Unit -1: Open mapping theorem ,Closed graph theorem , Hahn –Banach theorem for linear spaces .

Unit -2: Inner product spaces , Hilbert spaces , some properties of Hilbert spaces ,Schwarz inequality.

Unit -3: Orthogonal complements , projection theorem , Orthonormal sets , Bessel’s inequality ,complete Orthonormal set .

Unit -4: The conjugate space H^* ,Riesz representation theorem for continuous linear functional on a Hilbert space .

Unit -5: The Adjoint of an Operator , self adjoint operator ,Normal and operators.

Outcome

To be able to understand the method of application of Open mapping theorem ,Closed graph theorem , Hahn –Banach theorem for linear spaces

To be able to understand of application of Inner product spaces

To be able to understand the method of application of Orthogonal complements

To be able to understand the method of application of the conjugate space H^*

To be able to understand the method of application of the Adjoint of an Operator

Recommended Text

1. P.K. Jain ,O.P. Ahuja and Khalil Ahmad ,Functional Analysis ,New Age International (P) Limited & Wiley Eastern Ltd. New Delhi ,1997.
 2. K.K. Jha ,Functional Analysis ,Students Friends ,1986.
 3. B.Chaudhary and Sudarshan Nanda ,Functional Analysis with applications ,Wiley Eastern Ltd. ,1989.
 4. H.K Pathak Shiksha Sahitya Prakashan Functional Analysis
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Department: Mathematics

| Subject Code | Subject Name | Credits | Maximum marks Allotted | | | | | Duration of Exam. | | |
|--------------|-----------------------|----------|------------------------|-------|------------|-----------|----------|-------------------|--------|-----------|
| | | | Theory | | | Practical | | Total | Theory | Practical |
| | | | Major | Minor | Sessional. | End Sem | Lab Work | | | |
| SMMA 402 | Integral Transform-II | 4(3+1+0) | 50 | 20 | 30 | - | - | 100 | 3 hr | - |

Pattern:

The question paper will consist of six questions. Question no. 1 will have 10 objective type questions of 10 marks, covering entire syllabus. Objective questions should have right mix of questions to test the logic, problem solving skill and reasoning. Each objective question should have four choices to pick up from. Remaining five questions will carry 08 marks each, one from each of the five units of the syllabus and may have internal choice. These five questions will have two parts A & B, preferably one theoretical and other numerical. Questions should test the concepts, knowledge and application. Candidates are required to answer all the questions.

Objective

Explain the method of application of Fourier transform in initial and boundary value problems

Explain the method of application of Hankel transform

Explain the method of application of Hankel transform of $(d^2 f)/(dx)^2 + 1/x \quad df/dx - n^2/x^2 f$

Explain the method of application of Hankel transform of $(d^2 f)/(dx)^2 + 1/x \quad df/dx$

Explain the method of application of Mellin transforms

Syllabus

Unit-I: Application of Fourier transform in initial and boundary value problems: Application of infinite Fourier transform. Choice of infinite sine or cosine transforms. Applications of finite Fourier transform. Finite Fourier transform of partial derivatives.

Unit-II: Definition of Hankel transform. Inversion formula for the Hankel transforms. Some important results for Bessel functions. Linearity property. Hankel transform of the Derivatives of a Function.

Unit-III: Hankel transform of $(d^2 f)/(dx)^2 + 1/x \quad df/dx - n^2/x^2 f$. Parseval's Theorem. Definition of finite Hankel transform. Another form of Hankel transform. Hankel transform of df/dx .

Unit-IV: Hankel transform of $(d^2 f)/(dx)^2 + 1/x \quad df/dx$, where p is the root of the equation $J_n(ap) = 0$. Applications of Hankel Transform in initial and boundary value problems.

Unit-V: Definition of Mellin transforms. The Mellin Inversion theorem. Linearity property. Some elementary properties & Mellin transform. Mellin transform of derivatives. Mellin transform of integrals. Convolution (or falting).

Outcome

To be able to understand the method of application of Fourier transform in initial and boundary value problems

To be able to understand the method of application of Hankel transform

To be able to understand the method of application of Hankel transform of $(\frac{d^2 f}{dx^2} + 1/x \frac{df}{dx} - n^2/x^2)f$

To be able to understand the method of application of Hankel transform of $(\frac{d^2 f}{dx^2} + 1/x \frac{df}{dx})$

To be able to understand the method of application of Mellin transforms

Recommended Text

1. I.N.Sneddon : The Uses & integral transform.
2. C.J.Tranter: Integral transform.
3. Tricomi: Integral equations.
4. Dr.ShantiSwarup : Goyal & Gupta Integral Transforms.

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AISECT UNIVERSITY, Hazaribag (JH)
Scheme of Examination

Department: Mathematics

| Subject Code | Subject Name | Credits | Maximum marks Allotted | | | | | Duration of Exam. | | |
|--------------|---------------------|----------|------------------------|-------|------------|-----------|----------|-------------------|--------|-----------|
| | | | Theory | | | Practical | | Total | Theory | Practical |
| | | | Major | Minor | Sessional. | End Sem | Lab Work | | | |
| SMMA 403 | Special Function-II | 4(3+1+0) | 50 | 20 | 30 | - | - | 100 | 3 hr | - |

Pattern:

The question paper will consist of six questions. Question no. 1 will have 10 objective type questions of 10 marks, covering entire syllabus. Objective questions should have right mix of questions to test the logic, problem solving skill and reasoning. Each objective question should have four choices to pick up from. Remaining five questions will carry 08 marks each, one from each of the five units of the syllabus and may have internal choice. These five questions will have two parts A & B, preferably one theoretical and other numerical. Questions should test the concepts, knowledge and application. Candidates are required to answer all the questions.

Objective

Explain the method of application of Hermit Polynomials solution of Hermite's differential equation
 Explain the method of application of Bateman's Generating Relation
 Explain the method of application of Laguerre Polynomials Solution of Laguerre's differential equation
 Explain the method of application of Generalised Laguerre Polynomial
 Explain the method of application of Jacobi Polynomials

Syllabus

UNIT – 1: Introduction of Hermit Polynomials solution of Hermite's differential equation, Generating Function of Hermite Polynomials Rodrigues Formula for $H_n(x)$, Recurrence relations for $H_n(x)$

UNIT – 2: Bateman's Generating Relation Integral Representation of Hermite Polynomial orthonormal Properties of $H_n(x)$, Expansions of Polynomials.

UNIT – 3: Introduction of Laguerre Polynomials Solution of Laguerre's differential equation, Generating Function of Laguerre Polynomials, Rodrigues Formula, Recurrence Relations of Rodrigues Formula.

UNIT – 4: Generalised Laguerre Polynomial, Recurrence Relation.

UNIT – 5; Introduction of Jacobi Polynomials, Generating Functions of Jacobi Functions
Rodrigues Formula , Orthogonal Properties Recurrence Relation .

Outcome

To be able to understand the method of application of Hermit Polynomials solution of Hermite's differential equation

To be able to understand the method of application of Bateman's Generating Relation

To be able to understand the method of application of Laguerre Polynomials Solution of Laguerre's differential Equation

To be able to understand the method of application of Generalised Laguerre Polynomial

To be able to understand the method of application of Jacobi Polynomials

Recommended Text

1. J.N. Sharma , Special Function , Pragati Prakashan Meerut.
2. H.K. Pathak , Special Functions, Shriresha Sahitya Prakashan.

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AISECT UNIVERSITY, Hazaribag (JH)
Scheme of Examination

Department: Mathematics

| Subject Code | Subject Name | Credits | Maximum marks Allotted | | | | | Duration of Exam. | | |
|--------------|--------------------|----------|------------------------|-------|------------|-----------|----------|-------------------|--------|-----------|
| | | | Theory | | | Practical | | Total | Theory | Practical |
| | | | Major | Minor | Sessional. | End Sem | Lab Work | | | |
| SMMA 404 | Operation Research | 4(3+1+0) | 50 | 20 | 30 | - | - | 100 | 3 hr | - |

Pattern:

The question paper will consist of six questions. Question no. 1 will have 10 objective type questions of 10 marks, covering entire syllabus. Objective questions should have right mix of questions to test the logic, problem solving skill and reasoning. Each objective question should have four choices to pick up from. Remaining five questions will carry 08 marks each, one from each of the five units of the syllabus and may have internal choice. These five questions will have two parts A & B, preferably one theoretical and other numerical. Questions should test the concepts, knowledge and application. Candidates are required to answer all the questions.

Objective

- Explain the method of application of Operation research and its Scope
- Explain the method of application of Algorithms for Linear Programming
- Explain the method of application of Transportation and Assignment Problems.
- Explain the method of application of Networks Analysis
- Explain the method of application of Dynamic Programming

Syllabus

UNIT – 1: Operation research and its Scope , Necessity of Operation Research in Industry , Linear Programming – Simplex Method, theory of the Simplex Method , Duality and Sensitivity Analysis .

UNIT – 2: Algorithms for Linear Programming- Dual Simplex Method , Parametric Linear Programming , Upper – Bound Technique , Interior Point Algorithm, Linear Goal Programming.

UNIT – 3: Transportation and Assignment Problems.

UNIT – 4: Networks Analysis – Shortest Path Problem , Minimum Spanning Tree Problem , Maximum Flow Problem , Minimum cost Flow Problem , Network Simplex Method , Project Planning.

UNIT – 5: Dynamic Programming-Deterministic and Probabilistic Dynamic Programming

Recommended Text

1. Kanti swarup , P.K. Gupta and Man Mohan ; Operation Research , Sultan Chand & Sons , New Delhi
 2. G. Hadley , Linear Programming , Narosa Publishing House , 1995
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