DIRECTORATE OF DISTANCE EDUCATION
DEPARTMENT OF MATHEMATICS
UNIVERSITY OF NORTH BENGAL
TRUNCATED SYLLABUS FOR M.SC IN MATHEMATICS
(Semester Pattern with CBCS)
(In View of COVID-19)

Semester 1

Subject course No	**Course**
DEMATH1CORE1	Abstract algebra
DEMATH1CORE2	Complex Analysis I
DEMATH1SCORE3	Analysis of several variables
DEMATH1ELEC4/DEMATH1ELEC5	Differential Geometry/p-adic Analysis
DEMATHASSG1	Assignment

Semester 2

Subject course No	**Course**
DEMATH2CORE1	Real Analysis
DEMATH2CORE2	Point set Topology
DEMATH2SCORE3	Ordinary Differential Equations
DEMATH2ELEC4/DEMATH2ELEC5	Theory of Rings and Modules/Complex Analysis II
DEMATHASSG2	Assignment

Semester 3

Subject course No	**Course**
DEMATH3CORE1	Linear Algebra
DEMATH3CORE2	Functional Analysis
DEMATH3SCORE3	Partial Differential Equations
DEMATH3OLEC4/DEMATH3OLEC5	Discrete Mathematics/Elementary Number theory
DEMATHASSG3	Assignment

Semester 4

Choose any two courses from **DEMATH4ELEC4, DEMATH4ELEC5, DEMATH4ELEC6,** and **DEMATH4ELEC7**

Subject Course No	Course
DEMATH4CORE1	Abstract Measure theory
DEMATH4SCORE2	Numerical problem solving by computer programming (THEORY)
DEMATH4SCORE3	Numerical problem solving by computer programming (PRACTICAL)
DEMATH4ELEC4	Integral equation and integral transform
DEMATH4ELEC5	Field extension and Galois theory
DEMATH4ELEC6	Algebraic Topology
DEMATH4ELEC7	General theory of Integration
DEMATHASSG4	Assignment

Semester –I

Paper: DEMATH1CORE1

Abstract Algebra

Homomorphism of Groups, Isomorphism Theorems, Cayley's Theorem, Conjugacy Relation, Class Equation, Cauchy's Theorem, Sylow's Theorems and applications.

Ring Homomorphism, Isomorphism Theorems , Ideal and Quotient Ring, Prime and irreducible elements, Maximal and Prime Ideals, Irreducible and prime elements in a Ring.

References

1. David S. Dummit and Richard M. Foote, Abstract Algebra (3e), John Wiley and Sons.
2. Joseph R. Gallian, Contemporary Abstract Algebra, Narosa Publishing House.
3. John B. Fraleigh, A First Course in Abstract Algebra, Narosa Publishing House.
4. Michael Artin, Algebra, Prentice Hall.
5. Thomas Hungerford, Algebra, Springer GTM.
6. I.N. Herstein, Topics in Abstract Algebra, Wiley Eastern Limited.
7. D. S. Malik, J. N. Modrdeson and M. K. Sen, Fundamentals of Abstract Algebra, Mc Graw-Hill, International Edition, 1997.
8. J. J. Rotman, The Theory of Groups: An Introduction, Allyn and Bacon, Inc., Boston.

Paper: DEMATH1CORE2

Complex analysis I

Complex integration., Cauchy-Goursat Theorem (for convex region), Winding number, Cauchy's integral formula, Higher order derivatives, Morera's Theorem, Liouville's Theorem, The fundamental theorem of algebra, Zeros of analytic functions, Maximum modulus principle, Hadamard's three circle theorem, Taylor's theorem, Schwarz lemma, Laurent's series, Isolated singularities, Casoratti-weierstrass theorem.

Residues, Cauchy's residue Theorem, Rouche's Theorem, Meromorphic functions, The argument_principle.

References

1. H. A. Priestly, Introduction to Complex Analysis, Clarendon Press Oxford, 1990.
2. J. B. Conway, Functions of one Complex variable. Springer-Verlag. International Student Edition, Narosa Pub. House. 1980.
3. Liang-shin Hahn & Bernard Epstein, Classical Complex Analysis. Jones and Bartlett Pub. International London, 1996.
4. L. V. Ahlfors. Complex Analysis, McGraw-Hill.
5. S. Lang. Complex Analysis, Addison Wesley. 1970.
6. D. Sarason, Complex Function Theory , Hindustan Book Agency, Delhi, 1994.
7. E. Hille, Analytic Function Theory (2 vols) , Gonn & Co, 1959.
8. W.H.J. Fuchs, Topics in the Theory of Functions of one complex variable, D. Van Nostrand Co. , 1967.
9. C. Caratheodory. Theolry of ;Functions (2 vols) Chelsea Publishing Company, 1964.
10. M. Heins, Complex Function Theory. Academic Press, 1968.
11. Walter Rudin, Real and Complex Analysis, McGraw - Hill Book Co, 1966.
12. S. Saks and A. Zygmund, Analytic Functions, Monografie Matematyczne, 1952.
13. E. C. Titchmarsh, The Theory of Functions, Oxford Univ. Press, London.
14. W. A. Veech, A Second Course in Complex Aanlysis. W. A. Benjamin, 1967.
15. S. Ponnusamy, Foundations of Complex Analysis, Narosa Pub. House, 1997.

Paper: DEMATH1SCORE3
Analysis of Several Variables

Differentiability of maps from $\mathbb{R}^m$ to $\mathbb{R}^n$ and the derivative as a linear map. Determinant as mapping; its continuity and differentiability. Existence and meaningfulness of e^A and its continuity as well as differentiability (A is a real square matrix). Chain Rule, mean value theorem for differentiable functions.
Multiple integrals, Existence of the Riemann integral for sufficiently well-behaved functions on rectangles, i.e., product of intervals. Inverse and implicit function theorems (without proof).

Curves in $\mathbb{R}^2$ and $\mathbb{R}^3$. Line integrals, Surfaces in $\mathbb{R}^3$, Surface integrals, Integration of forms, Divergence, Gradient and Curl operations, Green's theorem, Gauss (Divergence) theorem and Stoke's theorem (statements only).

References

1. M. Spivak: Calculus on manifolds, Benjamin (1965).
2. W. Rudin: Principles of mathematical analysis, Mc Graw-Hill.
3. T. Apostol: Mathematical Analysis
4. Munkres, J., Analysis on Manifolds.
5. T. Apostol: Calculus (Vol 2), John Wiley.

Paper: DEMATH1ELEC4
Differential Geometry

Geometry of space curves: Serret-Frenet formulae, Equation of Straight lines, Helix, Bertrand curve.

Regular surfaces, differential functions on surfaces, the tangent plane and the differential maps between regular surfaces, the first fundamental form, normal fields and orientability.

Gauss map, shape operator, the second fundamental form, normal and principle curvatures, Gaussian and mean curvatures.

Geodesic, Exponential map, Theorem of Egregium, Geodesic curvature.

References:

1. Elementary Differential Geometry, Andrew Pressley, Springer, 2010.
2. Elementary Differential Geometry, Barrett O'Neill, Elsevier, 2006.
3. Elementary Differential Geometry, Christian Bär, Cambridge University Press, 2011.
4. Differential Geometry of Curves and Surfaces, Manfredo P. Do Carmo, Prentice-Hall, Inc., Upper Saddle River, New Jersey 07458, 1976.
5. A Text Book of Differential Geometry, U. C. De, Asian Books Pvt. Ltd, 2014.
6. An Introduction to Differential Geometry (with the use of tensor Calculus), Princeton University Press, 1940.
7. Tensor Calculus and Differential Geometry, P. K. Nayak, PHI Pvt. Ltd, 2012.

Paper: DEMATH1ELEC5
P-adic Analysis

I. The p-adic norm and the p-adic numbers

II. Some elementary p-adic analysis

III. The topology of $\mathbb{Q}_p$

IV. p-adic algebraic number theory

References:

1. G. Bachman, Introduction to p-adic numbers and valuation theory, Academic Press (1964).

2. J. W. S. Cassels, Local fields, Cambridge University Press (1986).

3. F. Q. Gouvˆea, p-adic Numbers: An Introduction, 2nd edition, Springer-Verlag (1997).

4. S. Katok, p-adic analysis compared with real, American Mathematical Society (2007).

5. N. Koblitz, p-adic numbers, p-adic analysis and zeta functions, second edition, Springer-Verlag (1984).

6. S. Lang, Algebra, revised third edition, Springer-Verlag (2002).

7. K. Mahler, Introduction to p-adic numbers and their functions, second edition, Cambridge University Press (1981).

8. AM. Robert, A course in p-adic analysis, Springer-Verlag, 2000.

Semester-II

Paper: DEMATH2CORE1
Real Analysis

Lebesgue outer measure, Measurable sets , regularity, Measurable Functions, Borel and Lebesgue measurability.

References:

1. Fundamentals of Real Analysis, S K. Berberian, Springer.
2. Measure Theory and Integration, G. De Barra, New Age International Publ.
3. Real Analysis, H. L. Royden.
4. Principles of Mathematical Analysis, W. Rudin.
5. Lectures on Real Analysis, J. Yeh, World Sci.
6. *R. G. Bartle, The Elements of Integration, John Wiley & Sons, Inc. New York, 1966*

Paper: DEMATH2CORE2
Point-Set Topology

Topological spaces, open and closed sets, basis and sub-basis, closure, interior and boundary of a set. Subspace topology. Continuous maps: properties and constructions; Pasting Lemma. Open and closed maps, Homeomorphisms. Product topology.

Countability and separation axioms: Urysohn's lemma, Tietze extension theorem and applications. Urysohn embedding lemma and metrization theorem for second countable spaces. Connected, path-connected and locally connected spaces. Lindelof and Compact spaces.

References:

1. J. R. Munkres, Topology: a first course, Prentice-Hall (1975).
2. G.F. Simmons, Introduction to Topology and Modern Analysis, TataMcGraw-Hill (1963).
3. M.A. Armstrong, Basic Topology, Springer.
4. J. L. Kelley, General Topology, Springer-Verlag (1975).
5. J. Dugundji, Topology, UBS (1999).
6. Stephen Willard, General Topology, Dover (2004).

Paper: DEMATH2SCORE3
Ordinary Differential Equations

Power Series methods with properties of Bessel functions , Legendré polynomials and Hermite polynomials.

Existence and Uniqueness of Initial Value Problems: Picard's and Peano's Theorems, Gronwall's inequality, continuation of solutions and maximal interval of existence, continuous dependence.

Boundary Value Problems for Second Order Equations: Sturm comparison theorems and oscillations, eigenvalue problems.

References

1. S. L. Ross, Differential Equations, 3rd Edn., Wiley India, 1984.
2. G.F. Simmons, Differential Equations with Applications and Historical Notes, Tata-McGrawHill 2003.
3. M.Brown, Differential Equations and Their Applications, Springer 1983.
4. W. Boyce and R. Diprima, Elementary Differential Equations and Boundary Value Problems.
5. G. Birhoff & G.C. Rofa Ordinary Differential Equations, Wily ,1978

Paper: DEMATH2ELEC4
Theory of Rings and Modules

Ring Theory- Noetherian and Artinian Rings, Hilbert Basis Theorem, Cohen's Theorem. Radicals of Rings and Modules, Primary Decomposition of Noetherian rings.

Module theory- Modules, sub modules, quotient modules; homomorphism and isomorphism theorems. Commutativity of Diagrams, Exact Sequences, Four Lemma, Five Lemma. Direct Sum and product of modules, free modules, cyclic modules, simple and semi-simple modules, projective and injective modules, flat modules.

References:

1. Lang, S., Algebra, Addison-Wesley, 1993.
2. Lam, T.Y., A First Course in Non-Commutative Rings, Springer Verlag
3. Algebra, by Michael Artin, Prentice Hall.
4. Herstein, I.N., Topics in Abstract Algebra, Wiley Eastern Limited.
5. Malik, D.S., Mordesen, J.M., Sen, M.K., Fundamentals of Abstract Algebra, The McGraw-Hill Companies, Inc.
6. David S. Dummit and Richard M. Foote, Abstract Algebra (3e), John Wiley and Sons.
7. T. S. Blyth, Module Theory: An Approach to Linear Algebra, Oxford University Press, 1977.
8. M. Atiyah, I.G. MacDonald, Introduction to Commutative Algebra, Addison-Wesley, 1969.
9. Thomas Hungerford, Algebra, Springer GTM.

Paper: DEMATH2ELEC5
Complex Analysis II

Harmonic Function: Definition, Examples, Harmonic Conjugate of a Harmonic function, Poisson's integral formula (without proof), Mean value property, The maximum and minimum principles, Characterization of harmonic function by mean value property.
Infinite Product: Definition, Necessary condition for convergence, General principle of convergence.

Integral Function: Factorization of Integral function, Weierstrass's Primary factor, Weierstrass factorization theorem, functions of finite order, Examples, The function n(r), Exponent of Convergence of Zeros, Canonical products, Hadamard's factorization theorem, Genus.

References:

1. H.A Priestly, Introduction to Complex Analysis, Clarendon Press Oxford, 1990.
2. J.B. Conway, Functions of one Complex variable, Springer-Verlag, International student-edition, Narosa Pub. House, 1980.
3. Liang-Shin Hahn and Bernard Epstein, Classical Complex Analysis, Jones and
4. Bartlett Pub. International London, 1996.
5. L.V. Ahlfors, Complex Analysis, McGraw.
6. S. Lang, Complex Analysis, Addison Wesley, 1970.
7. D. Sarason, Complex Function Theory, Hindustan Book Agency, Delhi, 1994.
8. Mark J. Ablowitz and AS. Fokas, Complex Variables: Introduction and Applications, Cambridge University Press, South Asian edn. 1998.
9. E. Hille, Analytic Function Theory (2 Vols), Gonn and Co., 1959.
10. W. H. J. Fuchs, Topics in the Theory of Functions of one complex variable, D. Van Nostrand Co., 1967.
11. C. Caratheodory, Theory of Functions (2 vols), Chelsea Publishing Company, 1964.
12. M. Heins, Complex Function Theory, Academic Press, 1968.
13. Walter Rudin, Real and Complex Analysis, McGraw- Hill Book Co., 1966.
14. S. Saks and A Zygmund, Analytic Functions, Monographie Matematyczne, 1952.
15. E.C. Titchmarsh, The Theory of Functions, Oxford University Press, London.
17. S. Ponnusamy, Foundations of Complex Analysis,Narosa Publication House, 1997.

Semester-III

Paper: DEMATH3CORE1
Linear Algebra

Linear transformations, Algebra of linear transformations, Matrix representation of linear transformations. Change of Basis.

Annihilating polynomials, diagonal forms, triangular forms, Direct Sum Decompositions, Invariant Direct sums, The Primary Decomposition Theorem.

Jordan Blocks and Jordan forms.

Inner product spaces, orthonormal basis. Quadratic forms, reduction and classification of quadratic forms.

References

1. K. Hauffman and R. Kunz, Linear Algebra, Pearson Education (INDIA), 2003.
2. G. Strang, Linear Algebra And Its Applications, 4th Edition, Brooks/Cole, 2006.
3. S. Lang, Linear Algebra, Springer, 1989.
4. David S. Dummit and Richard M. Foote, Abstract Algebra (3e), John Wiley and Sons.
5. R. Gallian Joseph, Conte mporary Abstract Algebra, Narosa Publishing House.
6. Thomas Hungerford, Algebra, Springer GTM.
7. I.N. Herstein, Topics in Abstract Algebra, Wiley Eastern Limited.
8. D.S. Malik, J.M. Mordesen, M.K. Sen, Fundamentals of Abstract Algebra, The McGraw-Hill Companies, Inc.

Paper: DEMATH3CORE2
Functional Analysis

Normed linear spaces. Banach spaces and examples. Quotient space of normed linear spaces and its completeness, equivalent norms. Riesz Lemma, basic properties of finite dimensional normed linear spaces and compactness. Weak convergence and bounded linear transformations, normed linear spaces of bounded linear transformations, dual spaces with examples.

Uniform boundedness theorem and some of its consequences. Open mapping and closed graph theorems. Hahn-Banach theorem for real linear spaces, complex linear spaces and normed linear spaces.

Inner product spaces. Hilbert spaces. Orthonormal sets. Bessel's inequality. Comlplete orthonormal sets and Parseval's identity. Structure of Hilbert spaces. Projection theorem. Riesz representation theorem (without proof).

References:

1. G. Bachman and L. Narici, Functional Analysis, Academic Press, 1966.
2. N. Dunford and J. T. Schwartz, Linear Operators, Part I, Interscience, New York, 1958.
3. R. E. Edwards, Functional Analysis. Holt Rinehart and Winston, New York, 1965.
4. C. Goffman and G. Pedrick, First Course in Functional Analysis, Prentice Hall of India, New Delhi, 1987.
5. R. B. Holmes, Geometric Functional Analysis and its Applications, Springer-Verlag 1975.
6. L. V. Kantorovich and G. P. Akilov, Functional Analysis, Pergamon Press, 1982.
7. K. Kreyszig , Introductory Functional Analysis with Applications, John Wiley & Sons New York, 1978.
8. B. K. Lahi;ri, Elements of Functional Analysis, The World Press Pvt. Ltd. Calcutta, 1994.
9. B. V. Limaye, Functional Analysis, Wiley Eastern Ltd.
10. L. A. Lustenik and V. J. Sobolev, Elements of Functional Analysis, Hindustan Pub. Corpn. N.Delhi 1971.
11. G. F. Simmons, Introduction to Topology and Modern Analysis, McGraw -Hill Co. New York , 1963.
12. A. E. Taylor, Introduction to Functional Analysis, John Wiley and Sons, New York, 1958.
13. K. Yosida, Functional Analysis, 3rd edition Springer - Verlag, New York 1971.

Paper: DEMATH3SCORE3

Partial Differential Equations

Classification of Second Order Partial Differential Equations: normal forms and characteristics.

Heat equation: initial value problem, fundamental solution, weak and strong maximum principle and uniqueness results.

Wave equation: uniqueness, D'Alembert's method, method of spherical means and Duhamel's principle.

Methods of separation of variables for heat, Laplace and wave equations.

References:

1. S. L. Ross, Differential Equations, 3rd Edn., Wiley India, 1984.
2. DiBenedetto, Partial Differential Equations, Birkhaüser, 1995.
3. L.C. Evans, Partial Differential Equations, Graduate Studies in Mathematics, Vol. 19, American Mathematical Society, 1998.
4. I.N. Sneddon Elements of Partial Differential Equations McGrawHill 1986.
5. R. Churchil & J. Brown, Fourier Series & Boundary Value Problems.
6. R.C. McOwen , Partial Differential Equations (Pearson Edu.) 2003.

Paper: DEMATH3OLEC4
Discrete Mathematics

Number Theory and Cryptography: Divisibility and Modular Arithmetic, Integer, Representations and Algorithms, Primes and Greatest**,** Common Divisors, Solving Congruences, Applications of Congruences, Cryptography.
Counting Techniques: The Basics of Counting, The Pigeonhole Principle Permutations and Combinations, Binomial Coefficients and Identities, Generalized Permutations and Combinations, Applications of Recurrence Relations, Solving Linear Recurrence Relations, Recurrence Relations, Generating**,** Functions, Principle of Inclusion–Exclusion, Applications of Inclusion–Exclusion. Modeling with recurrence relations with examples of Fibonacci numbers and the tower of Hanoi problem, Solving recurrence relations. Divide-and-Conquer relations with examples (no theorems).Generating functions, definition with examples, solving recurrence relations using generating functions, exponential generating functions. Difference equations.

Graph Theory : Elements of Graph Theory, Eulerian and Hamiltonian graphs, Planar Graphs, Directed Graphs, Trees, Tree traversals, binary search trees, Permutations and Combinations, Pigeonhole principle, principle of Inclusion and Exclusion, Derangements.

References:

1. Kenneth H. Rosen - Discrete Mathematics and Its Applications, Tata Mc-Graw-Hill, 7th Edition, 2012.

2. Bernard Kolman, Robert C. Busby, Sharon Cutler Ross-Discrete Mathematical Structures-Prentice Hall, 3rd Edition, 1996.

3. Grimaldi R-Discrete and Combinatorial Mathematics. 1-Pearson, Addison Wesley, 5th Edition, 2004.

4. C. L. Liu – Elements of Discrete Mathematics, McGraw-Hill, 1986.

5. F. Harary – Graph Theory, Addition Wesley Reading Mass, 1969.

6. N. Deo – Graph Theory With Applications to Engineering and Computer Science, Prentice Hall of India, 1987.

7. K. R. Parthasarathy – Basic Graph Theory, Tata McGraw-Hill, New Delhi, 1994.

8. G. Chartand and L. Lesniak – Graphs and Diagraphs, wadsworth and Brooks, 2nd Ed.,

9. Clark and D. A. Holton – A First Look at Graph Theory, Allied publishers.

10. D. B. West – Introduction to Graph Theory, Pearson Education Inc.,2001, 2nd Ed.,

11. J. A. Bondy and U. S. R. Murthy – Graph Theory with applications, Elsevier, 1976

12. J. P. Tremblay & R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, McGraw Hill Book Co. 1997

13. S. Witala, Discrete Mathematics - A Unified Approach, McGraw Hill Book Co.

Paper: DEMATH3OLEC5
Elementary Number Theory

Congruences, Fermat's Little Theorem, Pseudoprimes, Euler's Theorem, Wilson's theorem, linear congruences, order of an integer modulo a prime, primitive roots for primes, quadratic residues, Legendre's Symbol and its properties, Law of Quadratic Reciprocity.

Arithmetic functions like Mobius function, Euler phi function, greatest integer function etc. Mobius inversion formula, Dirichlet's product of arithmetical functions, Dirichlet's inverse, The Mangoldt function.

References:

1. David M. Burton, Elementary Number Theory, University of New Hampshire.
2. G.H. Hardy, and , E.M. Wrigh,. An Introduction to the Theory of Numbers (6th ed, Oxford University Press, (2008).
3. W.W. Adams and L.J. Goldstein, Introduction to the Theory of Numbers, 3rd ed., Wiley Eastern, 1972.
4. A. Baker, A Concise Introduction to the Theory of Numbers, Cambridge University Press, Cambridge, 1984.
5. I. Niven and H.S. Zuckerman, An Introduction to the Theory of Numbers, 4th Ed., Wiley, New York, 1980.
6. T.M. Apostol, Introduction to Analytic number theory, UTM, Springer, (1976).
7. J. W. S Cassel, A. Frolich, Algebraic number theory, Cambridge.
8. M Ram Murty, Problems in analytic number theory, springer.
9. M Ram Murty and Jody Esmonde, Problems in algebraic number theory, springer.

Semester-IV

Paper: DEMATH4CORE1

Abstract Measure Theory

Abstract measure spaces: σ-algebra of sets, limit of sequences of sets, Borel σ-algebra, measure on a σ-algebra, measurable space and measure space.

Borel and Lebesgue measurability of functions on $\mathbb{R}$.

References:

1. Fundamentals of Real Analysis, S K. Berberian, Springer.
2. Measure Theory and Integration, G. De Barra, New Age International Publ.
3. Real Analysis, H. L. Royden.
4. Principles of Mathematical Analysis, W. Rudin.
5. Lectures on Real Analysis, J. Yeh, World Sci.
6. R. G. Bartle, The Elements of Integration, John Wiley & Sons, Inc. New York, 1966

Paper: DEMATH4SCORE2

Numerical problem solving by computer programming (THEORY)
Duration of Examination: 2 hours.

C Programming:
An overview of computer programming languages – modular programming and program development cycle. Constants, Variables and Fundamental data types; Operators and Expressions;
Conditional Branching – if, if-else, switch; Looping and nested looping – for, while, do-while; break and continue, goto; Infinite loops, Header file and include directive, macro substitu tion and conditional compilation, scanf, printf and various format specifiers, Standard C library functions.
One dimensional and two dimensional arrays;.

Reference:

1. B. Gottfried: Programming with C , Tata McGraw-Hill Edition 2002.
2. E. Balagurusamy : Programming in ANSI C, Tata Mcgraw Hill - Edition 2002.
3. Brain W. Kernighan & Dennis M. Ritchie, The C Programme Language, 2nd Edition (ANSI features) , Prentice Hall 1989.
4. Let Us C- Y.P. Kanetkar, BPB Publication - 2002.
5. Analysis of Numerical Methods—Isacsons & Keller.
6. Numerical solutions of Ord. Diff. Equations—M K Jain
7. Numerical solutions of Partial Diff. Equations—G D Smith.
8. Programming with C, B. Gottfried, Tata-McGraw Hill
9. Programming with C, K. R. Venugopal and Sudeep R. Prasad, Tata-McGraw Hill .

Paper: DEMATH4SCORE3

Numerical problem solving by computer programming (PRACTICAL)

Duration of Examination: 3 hours.

Solving Numerical Problems using C – Programming

1. Interpolation: Newtown forward, Newtown backward, Stirling, Lagrange etc.
2. Differentiation: Using interpolated polynomials.
3. Integration: Trapizoidal Method, Simpson Method, Romberge Method, Gauss Quadrature Method.
4. Matrix inversion: Gauss Jordan method.

- Note Book(5 marks) + Viva-voce(5 marks).
- (Solving 3 numerical problems by computer programming) ×5=15.

Reference:

1. B. Gottfried: Programming with C , Tata McGraw-Hill Edition 2002.
2. E. Balagurusamy : Programming in ANSI C, Tata Mcgraw Hill - Edition 2002.
3. Brain W. Kernighan & Dennis M. Ritchie, The C Programme Language, 2nd Edition (ANSI features) , Prentice Hall 1989.
4. Let Us C- Y.P. Kanetkar, BPB Publication - 2002.
5. Analysis of Numerical Methods—Isacsons & Keller.
6. Numerical solutions of Ord. Diff. Equations—M K Jain
7. Numerical solutions of Partial Diff. Equations—G D Smith.
8. Programming with C, B. Gottfried, Tata-McGraw Hill
9. Programming with C, K. R. Venugopal and Sudeep R. Prasad, Tata-McGraw Hill

Paper: DEMATH4ELEC4
Integral Equation and Integral Transform

Integral equations: classifications, successive approximations, separable kernels, Fredholm alternative, Hilbert-Schemidt theory of symmetric kernels.
Calculus of Variations, Euler-Lagrange's equations, Geodesics, Minimum surface of revolution.

Integral transforms: Laplace and Fourier transforms, Applications to boundary Value Problems, Inversion formulae, Convolutions and applications.

References:

1. M. Gelfand and S. V. Fomin. Calculus of Variations, Prentice Hall.
2. Linear Integral Equation: W.V. Lovitt (Dover).
3. Integral Equations, Porter and Stirling, Cambridge.
4. The Use of Integral Transform, I.n. Sneddon, Tata-McGrawHill, 1974
5. R. Churchil & J. Brown Fourier Series and Boundary Value Problems, McGraw-Hill, 1978
6. D. Powers, Boundary Value Problems Academic Press, 1979.

Paper: DEMATH4ELEC5

Field Extension and Galois Theory

Field extension – Algebraic and transcendental Extensions. Separable and Inseparable extensions. Perfect fields, Artin's Theorem, Normal extensions. Splitting fields of a polynomial. Finite fields. Primitive elements, Primitive Element Theorem, Algebraically closed fields, Algebraic closure of a field and its existence.

Galois extensions. Galois Group of automorphisms and Galois Theory, Fundamental theorem of Galois theory (without proof).

References

1. *M. Artin, Algebra, Perentice -Hall of India, 1991.*
2. *P.M. Cohn, Algebra, vols, I,II, & III, John Wiley & Sons, 1982, 1989, 1991.*
3. *N. Jacobson, Basic Algebra, vols. I & II, W. H. Freeman, 1980 (also published by Hindustan Publishing Company)*
4. *S. Lang. Algebra, 3rd edn. Addison-Weslley, 1993.*
5. *I.S. Luther and I.B.S. Passi, Algebra, Vol.III-Modules, Narosa Publishing House.*
6. *D. S. Malik, J. N. Modrdeson, and M. K. Sen, Fundamentals of Abstract Algebra, Mc Graw-Hill, International Edition, 1997.*
7. *Vivek Sahai and Vikas Bist, Algebra, Narosa Publishing House, 1999*
8. *I. Stweart, Galois Theory, 2nd edition, Chapman and Hall, 1989.*
9. *J.P. Escofier, Galois theory, GTM Vol.204, Springer, 2001.*

Paper: DEMATH4ELEC6
Algebraic Topology

Homotopy Theory : Fundamental Groups. Fundamental groups of Circle, Sphere and some surfaces. Geometrical construction of group structure on circle (in fact on any conic), Separation Theorem in the plane, Classification of surfaces.

References :

1. Satya Deo ,Algebraic Topology-A Primer , Hindustan Book Agency
2. James r. Munkres, topology ,PHI
3. Anant R. Shastri, Basic Algebraic Topology, CRC Press Book.

Paper: DEMATH4ELEC7
General Theory of Integration

Tagged Gauge Partitions. Definitions, Cousins Theorem, Right-left Procedure, Straddle Lemma, Application in continuity, Intrinsic Power.
Henstock–Kurzweil Integral. Definition and basic properties. Fundamental Theorem, Saks-Henstock Lemma, Inclusion of the Lebesgue integral. SqueezTheorem (without proof).

References:

1. A Modern Theory of Integration, R. G. Bartle, AMS
2. Theories of Integration, Douglas S. Kurtz & Charles W. Swartz, World Scientific.
3. Lanzhou Lectures on Henstock Integration, Lee Peng Yee, World Scintific.
4. The Riemann, Lebesgue and General Riemann Integrals, A.G. Das, Narosa.
5. The general Theory of integration, R. Henstock, Clarendon Press.