

WITH EFFECT FROM 2006-2007 ADMITTED
BATCH AND SUBSEQUENT BATCHES
ACHARYA NAGARJUNA UNIVERSITY POST GRADUATE CENTRE::NUZVID

M.Sc. APPLIED MATHEMATICS FIRST SEMESTER
PAPER--I:: REAL ANALYSIS

Max.Marks:80
Time: Three hours

The first question for 16 marks is compulsory containing 4 bits of equal marks covering one bit from each unit. The remaining four questions each carrying 16 marks shall be one from each unit with an internal choice of selecting one from given two.

UNIT - I

Basic Topology: Finite Countable and Uncountable sets, Metric Spaces, Compact Sets, Perfect Sets, Connected sets.
(Chapter 2 of Ref. (1))

UNIT – II

Continuity : Limits of functions, Continuous functions, Continuity and Compactness, Continuity and Connectedness, Discontinuities, Monotonic functions, Infinite limits and limits at infinity.
(Chapter 4 of Ref.(1))

UNIT – III

The Riemann-Steiltjes Integrals: Definition and Existence of the integral, Properties of integral, Integration and differentiation, Integration of Vector-valued functions, Rectifiable curves.
(Chapter 6 of Ref.(1))

UNIT – IV

Sequences and Series of Functions: Discussion of main problem, Uniform convergence, Uniform convergence and Continuity, Uniform convergence and Integration, Uniform convergence and Differentiation, Equicontinuous families of functions, The Stone-Weierstrass theorem.
(Sections 7.1 to 7.27 of Chapter 7 of Ref.(1))

References

1. Principles of Mathematical Analysis (Third edition) by Walter Rudin, McGraw-Hill International Book Company.

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ACHARYA NAGARJUNA UNIVERSITY POST GRADUATE CENTRE::NUZVID
M.Sc., APPLIED MATHEMATICS FIRST SEMESTER
PAPER-II:: ALGEBRA

Max.Marks:80
Time: Three hours

The first question for 16 marks is compulsory containing 4 bits of equal marks covering one bit from each unit. The remaining four questions each carrying 16 marks shall be one from each unit with an internal choice of selecting one from given two.

UNIT - I

Groups : Definition of a group, Some examples of group, Some preliminary lemmas, Subgroup, A counting principle, Normal subgroup and quotient groups, Homomorphisms, Automorphisms, Cayley's theorem.
(Sections 2.1 to 2.9 of Chapter 2 of Ref.(1))

UNIT - II

Groups (contd.) : Permutation groups, Another counting principle, Sylow's theorem, Direct products, Finite abelian groups.
Rings : Definitions and examples of rings, Some special classes of rings. Homomorphisms.
(Sections 2.10 to 2.14 of Chapter 2 and Sections 3.1 to 3.3 of Chapter 3 of Ref.(1))

UNIT - III

Rings(contd.) : Ideals and quotient rings, More ideals and quotient rings, The field of quotients of an integral domain, Euclidean rings, A particular Euclidian ring, Polynomial rings, Polynomials over the rational field, Polynomial rings over commutative rings.
(Sections 3.4 to 3.11 of Chapter 3 of Ref.(1))

UNIT - IV

Extension Fields : The Transcendence of 'e' roots of polynomials, More about roots, The elements of Galois theory, Solvability by radicals, Galois groups over the rationals.
(Sections 5.1 to 5.3 and 5.5 to 5.8 of chapter 5 of Ref.(1))

References

1. I.N.Herstein, Topics in Algebra(Second edition, 1999), John Wiley and Sons(ASIA) Pre. Ltd. Singapore.

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BATCH AND SUBSEQUENT BATCHES
ACHARYA NAGARJUNA UNIVERSITY POST GRADUATE CENTRE::NUZVID
M.Sc., APPLIED MATHEMATICS FIRST SEMESTER
PAPER–III:: ORDINARY DIFFERENTIAL EQUATIONS

Max.Marks:80
Time: Three hours

The first question for 16 marks is compulsory containing 4 bits of equal marks covering one bit from each unit. The remaining four questions each carrying 16 marks shall be one from each unit with an internal choice of selecting one from given two.

UNIT - I

Linear equations of the first order : Linear equations of the first order, The equation $y' + ay = 0$, The equation $y' + ay = b(x)$, The general equations of the first order.

Linear equations with constant coefficients : The homogeneous equation of order n , Initial value problems for n -th order equations, The non-homogeneous equation of order n , A special method for solving the non-homogeneous equation.

(Chapter 1 of Ref.(1) and Sections 7, 8, 10, 11 of Chapter 2 of Ref. (1))

UNIT - II

Linear equations with variable coefficients: Initial value problems for the homogeneous equations, Solution of the homogeneous equations, The wronskian and linear independence, Reduction of the order of a homogeneous equation, The Non-homogeneous equation, Homogeneous equations with analytic coefficients (The proof for the power series method is not needed), The Legendre equation.

(Chapter 3(excluding Sec.9) of Ref.(1))

UNIT - III

Linear equations with regular singular points : The Euler equation, Second order equations with regular singular points, An example second order equation with regular singular points, The general case, The exceptional cases, The Bessel Equation.

(Sections 1, 2, 3, 4, 6 and 7 of Chapter 4 of Ref.(1))

UNIT - IV

Existence Uniqueness and Continuation of Solutions : Existence Uniqueness of solutions of scalar differential equations, Existence theorem for system of differential equations, Differential and Integral inequalities.

(Section 1.1 to 1.5 of Chapter 1 of Ref.(2))

References

1. E.A.Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall of India, New Delhi(1987).
2. M.Rama Mohana Rao, Ordinary Differential Equations Theory and Applications, Affiliated East-West Press Pvt.Ltd., New Delhi.

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BATCH AND SUBSEQUENT BATCHES
ACHARYA NAGARJUNA UNIVERSITY POST GRADUATE CENTRE::NUZVID
M.Sc., APPLIED MATHEMATICS FIRST SEMESTER
PAPER--IV::TENSOR ANALYSIS AND PARTIAL DIFFERENTIAL EQUATIONS

Max.Marks:80
Time: Three hours

The first question for 16 marks is compulsory containing 4 bits of equal marks covering one bit from each unit. The remaining four questions each carrying 16 marks shall be one from each unit with an internal choice of selecting one from given two.

UNIT - I

Tensor Analysis : N-Dimensional space, Covariant and contravariant vectors, Contraction, Second and higher order tensors, Quotient law, Fundamental tensor, Associate tensor, Angle between the vector, Principal directions.
(Chapter 1 & Chapter 2 of Ref.(1))

UNIT - II

Tensor Analysis (contd.): Christoffel symbols, Covariant and intrinsic derivative Geodesics and parallelism.
(Chapter 3 & Chapter 4 of Ref.(1))

UNIT - III

Partial differential equations : Equations of the form $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$, Orthogonal trajectories, Paffian differential forms and first order equations, Cauchy's problems general integrals, Non-linear equations, Charpit's method and some special methods, Jacobi's method.
(Chapter 1(excluding Section 7 & 8), Chapter 2(excluding Section 14) of Ref.(2))

UNIT - IV

Second order partial differential equations : Second order partial differential equations constant and variable coefficients, Characteristic equations, Canonical forms separation of variables method, Monges method.
(Chapter 3(excluding Section 10) of Ref. (2))

References

1. Tensor Calculus by Barry Spain, 3rd edition, Radha Publishing House, Calcutta.
2. I.N.Sneddon, Elements of Partial Differential Equations, Mc Graw-Hill, International Student Edition, 1964.

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ACHARYA NAGARJUNA UNIVERSITY POST GRADUATE CENTRE::NUZVID
M.Sc., APPLIED MATHEMATICS FIRST SEMESTER
PAPER-V::CLASSICAL MECHANICS

Max.Marks:80

Time: Three hours

The first question for **16** marks is compulsory containing **4** bits of equal marks covering one bit from each unit. The remaining four questions each carrying 16 marks shall be one from each unit with an internal choice of selecting one from given two.

UNIT - I

Moments and Products of Inertia : Moments and products of inertia evaluation in standard cases, Theorem of Parallel and Perpendicular axes, Momental ellipsoid, Equi-momental systems, Principal axes at a point of its length.

(Sections 144 to 157 of Chapter XI of Ref.(1))

UNIT - II

D'Alembert's Principle : The general equations of motion of rigid body under finite and impulsive forces, Motion about a fixed axis of rigid body, Compound pendulum, Reactions of axis of rotation, Simple equivalent pendulums.

(Chapter XII (excluding Sec. 163 & 167), sections 168 to 176 and 179 to 181 of Chapter XIII of Ref.(1))

UNIT - III

Motion in two dimensions: Motion in two dimensions of a rigid body under finite and impulsive forces.

(Sections 187, 189 to 191, 194 to 202 of Chapter XIV, sections 204, 205, 207 of Chapter XV of Ref.(1))

UNIT - IV

Euler's equations of motion: Three dimensional motion, Euler's dynamical equations of motion of a rigid body about a fixed point under finite and impulsive forces, Eulerien angles, Euler's geometrical equations.

(Sections 9.2, 9.3 and 10.13 of Ref.(2))

*** For problems in all units refer Ref.(3)**

Reference

1. An Elementary Treatise on The Dynamics of a Particle and of Rigid Bodies by S.L.Loney, Macmillan Company of India Ltd., Metric Edition(1976).
2. "Text Book of Dynamics" by F.Chorlton, CBS Publishing and distributions, Seconed edition.
3. "Dynamics of a rigid bodies" by B.S. Tyagi, Brahmanad and Bhu Dev Sharma, Kedharnadh Ramnadh Publ., Meerut.

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BATCH AND SUBSEQUENT BATCHES
ACHARYA NAGARJUNA UNIVERSITY POST GRADUATE CENTRE::NUZVID
M.Sc., APPLIED MATHEMATICS SECOND SEMESTER
PAPER--I::COMPLEX ANALYSIS

Max.Marks:80
Time: Three hours

The first question for **16** marks is compulsory containing **4** bits of equal marks covering one bit from each unit. The remaining four questions each carrying 16 marks shall be one from each unit with an internal choice of selecting one from given two.

UNIT - I

Limits and continuity, Complex differentiability, Cauchy-Reiman equations, Exponential, logarithmic, trigonometric and hyperbolic functions. Line integral, local and global primitives, Cauchy-Goursat theorem, Cauchy's theorem.

(Chapters 3 & 4 of Ref.(1))

UNIT - II

winding number, Cauchy's integral formulae, Cauchy's estimate, Liouville's theorem, fundamental theorem of Algebra, Morera's theorem. Infinite series, Series of functions and uniform convergence, Power series.

(chapters 5 and 6 of Ref.(1))

UNIT - III

Taylor series, Zeros of analytic functions, Laurent series, Singularities, Conformal mapping, linear transformation, cross ratio symmetry, Schwarz-Christoffel transformation.

(Chapters 7 & 9 of Ref.(1))

UNIT-IV

Residue theorem and evaluation of standard integrals, logarithmic residue, Rouché's theorem.

(Chapter 8 of Ref.(1))

References

1. The Elements of Complex Analysis, B.Choudhary, Wiley Eastern Ltd., 1983.

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ACHARYA NAGARJUNA UNIVERSITY POST GRADUATE CENTRE::NUZVID
M.Sc., APPLIED MATHEMATICS SECOND SEMESTER
PAPER--II::DISCRETE MATHEMATICS

Max.Marks:80
Time: Three hours

The first question for 16 marks is compulsory containing 4 bits of equal marks covering one bit from each unit. The remaining four questions each carrying 16 marks shall be one from each unit with an internal choice of selecting one from given two.

UNIT - I

Propositions and Compound Propositions, Basic Logical Operations, Propositions and Truth tables, Tautologies and Contradictions, Logical Equivalence, Algebra of propositions, Conditional and Bi-conditional statements .Arguments, Logical Implication, Propositional Functions, Quantifiers, Negation of Quantified statement.

Relations, properties of Binary relations in a set, Relation Matrix and the Graph of a relation, Partial Ordering, Partial Ordered set, Representation and Associated Terminology.

(Chapter 4 of Ref.(2), Sections 2.3.1 to 2.3.3, 2.3.8 and 2.3.9 of Chapter 2 of Ref.(1))

UNIT - II

Group Codes :The communication model and basic notations of error correction , Generation of codes by using parity checks, error recovery in group codes.

Graph Theory :Graphs and Multigraphs. Subgraphs, isomorphic and homeomorphic graphs. Paths, connectivity. The bridges of Königsberg, Traversable Multigraphs. Labeled and Weighted graphs. Complete, Regular and Bipartite graphs. Tree graphs. Planar graphs.

(Section 3.7 of Ref.(1), sections 8.2 to 8.9 of Chapter 8 of Ref.(2))

UNIT - III

Lattices, Lattices as partially ordered sets, Some Properties of Lattices , lattices as Algebraic Systems , Sub-Lattices direct product and homomorphism, Some special Lattices.

(Sections 4-1.1 to 4-1.5 of Chapter 4 of Ref.(1))

UNIT - IV

Boolean Algebra, Sub- Algebra, Direct product and homomorphism, Boolean forms and free Boolean Algebra, Values of Boolean Expressions and Boolean Functions.

(Sections 4-2.1, 4-2.2, 4-3.1, 4-3.2 of chapter 4 of Ref.(1))

REFERENCES

1. Discrete Mathematical Structures with Applications to Computer Science by J.P.Tremblay and R.Manohar, Mc.Graw Hill, International Editions, Tata Mc.Graw Hill Book Company,1997.

2. Discrete Mathematics by Seymour Lipschitz and Marc Lipson, second Edition Tata McGraw Hill, Publishing Company Limited, New Delhi.

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BATCH AND SUBSEQUENT BATCHES
ACHARYA NAGARJUNA UNIVERSITY POST GRADUATE CENTRE::NUZVID
M.Sc., APPLIED MATHEMATICS SECOND SEMESTER
PAPER--III::NUMERICAL ANALYSIS AND FORTRAN -77 PROGRAMMING

Max.Marks:80
Time: Three hours

The first question for **16** marks is compulsory containing **4** bits of equal marks covering one bit from each unit. The remaining four questions each carrying 16 marks shall be one from each unit with an internal choice of selecting one from given two.

UNIT - I

Numerical techniques of solving transcendental and polynomial equations:

Bisection method, Secant method, Newton-Raphson method, Muller method, Chebyshev method, multi point method, Rate of Convergence, Iteration methods of first and second orders. Methods for Multiple roots. Polynomial equations, Birge-Vieta method, Bairstow method, Graeffe's root squaring method.

(Sections 2.1 to 2.7 of Chapter 2 of Ref.(1))

UNIT - II

Numerical techniques of solving systems of linear Algebraic equations:

Triangularization method, Gauss elimination method, Gauss-Jordan method, Cholesky method, partition method, Error analysis, Iterative methods: Jacobi method, Gauss-Seidel method. Numerical techniques of determining the eigen values and eigen vectors of a matrix, Jacobi method, Power method and Rutishauser method.

(Scope and treatment as in sections 3.1 to 3.5 of chapter 3 of Ref.(2))

UNIT - III

Fortran 77 Programming: Introduction, Flowcharts, Fortran programming preliminaries, Fortran constants and variables, Arithmetic expressions, Input-Output statements, Control statements.

(Chapters 1 to 8 of Ref.(1))

UNIT - IV

Do statements, Subscripted variables, Elementary format specifications, Logical variables and Logical expressions, Functions sub-programs, Sub-routine sub-programs, Simple examples on these topics.

(chapters 9 to 12 and 14 Ref. (1))

REFERENCES:

1. V.Rajaraman, Computer Programming in Fortran -77, 4th Edition Prentice-Hall of India private Ltd.,
2. M.K.Jain, S.R.K.Iyenger, R.K.Jain by Numerical methods for Scientific and Engineering Computation, 3rd edition, New age International (P) Ltd., Publishers.

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ACHARYA NAGARJUNA UNIVERSITY POST GRADUATE CENTRE::NUZVID
M.Sc., APPLIED MATHEMATICS SECOND SEMESTER
PAPER—IV::LINEAR PROGRAMMING

Max.Marks:80
Time: Three hours

The first question for **16** marks is compulsory containing **4** bits of equal marks covering one bit from each unit. The remaining four questions each carrying 16 marks shall be one from each unit with an internal choice of selecting one from given two.

UNIT - I

Linear programming problem-mathematical formulation, example of linear programming . Graphical examples, Basic solutions of a system of linear equations. Convex sets, Extreme points, Slack and Surplus variables, Reduction of a feasible solution to a basic feasible solution, Improving a basic feasible solution, Unbounded solutions, optimality conditions, alternative optima, Extreme points and basic feasible solutions,

(Sections 1.1 to 1.7 of Chapter 1, sections 2.16, 2.20 of Chapter 2 and Chapter 3 of Ref.(1))

UNIT - II

The Simplex method, selection of vector to enter the basis, initial basic feasible solution-artificial variables, Inconsistency and redundancy, Artificial basic techniques. Determination of all optimal solutions, Unrestricted variables.

(chapters 4(excluding sections 4.3&4.4), sections 5.1 to 5.3, 5.7 and 5.8 of Chapter 5 of Ref.(1))

UNIT - III

Example of cycling , Resolution of the Degeneracy problems, Charne's perturbation method. Dual linear programming problems.

(Section 6.1 to 6.5 and 6.10 of Chapter 6 of Ref. (1), Sections 8.1 to 8.6 of Chapter 8 of Ref.(1))

UNIT - IV

General Transportation problem(T.P.P), Transportation Table, Solution of a T.P.P, Finding initial basic feasible solution, Test for optimality, Degeneracy in T.P.P., Modi method. Assignment Problems.

(Sections 10.1 to 10.3, 10.8 to 10.12 of Chapter 10, sections 11.1 to 11.3 of chapter 11 of Ref.(2))

REFERENCE:

1. Linear programming by G. Hadley, Narosa Publishing House, 1987.

2. Operations Research by Kanti Swarup, P.K.Gupta and Man Mohan, Sultan Chand & Sons, Educational Publishers, New Delhi

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ACHARYA NAGARJUNA UNIVERSITY POST GRADUATE CENTRE::NUZVID

M.Sc., APPLIED MATHEMATICS SECOND SEMESTER

PAPER—V::HIGHER MECHANICS

Max.Marks:80

Time: Three hours

The first question for **16** marks is compulsory containing **4** bits of equal marks covering one bit from each unit. The remaining four questions each carrying 16 marks shall be one from each unit with an internal choice of selecting one from given two.

UNIT - I

Generalized coordinates, Velocities, Forces, Holonomic and non-holonomic systems, conservative and non-conservative systems. Lagrange's equations of motion of holonomic (non-holonomic) and conservative (non-conservative) systems. Theory of small oscillations of conservative holonomical dynamical systems.

(Sections 10.2 to 10.12 of Ref.(1) and for problems Ref.(2))

UNIT - II

Hamilton's principle for holonomic(non-holonomic) and conservative(non-conservative) systems from Lagrange's equations of motion, Cyclic coordinates, Conservation theorems, Routh's procedure and Hamilton's equation of motion from variational principle and from modified Hamilton's Principle, Principle of least action for holonomic and non-holonomic systems.

(Sections 2.1, 2.3, 2.4, 2.6, 8.1 to 8.3, 8.5 and 8.6 of Ref.(3))

UNIT - III

Canonical Transformations, Jacobi's theorem, Types of canonical transformation equations, Examples of C.T. Solution of Harmonic oscillator problem using canonical transformation, Symplectic approach to a canonical transformation, Infinitesimal canonical transformation, canonical transformations form a group, Exact differential condition, Bilinear invariant condition. Poisson and Lagrange brackets and invariance of them under C.T, Relation between Lagrange and Poisson brackets. Conditions for C.T. in terms of Lagrange and Poisson brackets.

(Sections 9.1 to 9.4 of Chapter 9 of Ref.(3), relevant articles in Ref.(4))

UNIT - IV

Generalized equation of motion, Jacobi's identity and Poisson theorem, Infinitesimal canonical transformation in terms of Poisson Brackets, Poincare's theorem, equation of motion. Hamilton-Jacobi equation for Hamilton's Principal function. The Harmonic oscillator problem as an example of the Hamilton-Jacobi method. The Hamilton-Jacobi equation for Hamilton's characteristic function.

(Section 9.4(Pages 399, 400, 402, 403), section 9.5(Pages 405, 406, 407) of Ref.(2), sections 10.1,10.2 and 10.3 of Ref.(3))

References

1. "Text Book of Dynamics" by F.Chorlton, CBS Publishing and distributions, Seconed edition.
2. "An Elementary Treatise on the Dynamics of a Particle and of rigid bodies" by S.L.Loney, MacMillan Co., of India Ltd., Metric Edition(1975).
3. "Classical Mechanics" by H.Goldstein, Narosa Publishing House, Second Edition(1985).

4. "A Treatise on the analytical dynamics of particles and rigid bodies" by E.T. Whittaker, Fourth edition, Cambridge University Press, 1964.