ANDHRA UNIVERSITY
COLLEGE OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF APPLIED MATHEMATICS

REVISED SYLLABUS
M.Sc. FIRST SEMESTER APPLIED MATHEMATICS
AM-101: REAL ANALYSIS
(With effect from 2007-2008 Admitted Batch)

Duration: 3 hours Maximum Marks: 85
(A total of seven questions are to be set and the student has to answer 5 (five) questions. All questions carry equal marks. The first question which is compulsory carries 17 marks. It consists of 4 short answer sub questions covering the entire syllabus. The remaining six questions each carrying 17 marks are to be set as suggested in the body of the syllabi.)

Basic Topology: finite, countable and uncountable sets, metric spaces, compact sets, perfect sets, connected sets. **(One question is to be set)**

Continuity: limits of functions, continuous functions, continuity and compactness, continuity and connectedness, discontinuities, monotone functions, infinite limits and limits at infinity. (Chapters 2 and 4 of Ref.1). **(One question is to be set)**

The Riemann - Stieltjes integral: linearity properties, integration by parts, change of variable, reduction to a Riemann integral, monotonically increasing integrators, Riemann's condition, comparison theorems, integrators of bounded variation, sufficient conditions for existence of R-S. integrals, necessary conditions for existence of R-S integrals, mean-value theorems for R-S integrals, integral as a function of interval, second fundamental theorem of integral calculus, second mean-value theorem for Riemann integrals. (Sections: 7.1 to 7.7 and 7.11 to 7.22 of Ref.2)
(One question is to be set)

Multivariable Differential Calculus: directional derivative, total derivative, Jacobian matrix, chain rule, mean-value theorem for differentiable functions, sufficient conditions for differentiability and for equality of mixed partial derivatives, Taylor's formula for real valued functions in n real variables. (Chapter 12 of Ref.2).
(One question is to be set)

Sequences and series of functions: uniform convergence, uniform convergence and continuity, uniform convergence and integration, uniform convergence and differentiation. equicontinuous families of functions, the Stone – Weierstrass theorem. (Chapter 7 of Ref.1) **(Two questions are to be set)**

Text Books: (1) Principles of Mathematical analysis by Walter Rudin (third edition) Mc.Graw Hill international edition, 1976.
(2) Mathematical Analysis by TOM.M.APOSTOL (Second Edition) Addison-Weslay publishing Company.

M.Sc. FIRST SEMESTER APPLIED MATHEMATICS
AM 102: TECHNIUES OF APPLIED MATHEMATICS-I
(With effect from 2007-2008 Admitted Batch)

Duration: 3 hours Maximum Marks: 85

(A total of seven questions are to be set and the student has to answer 5 (five) questions. All questions carry equal marks. The first question which is compulsory carries 17 marks. It consists of 4 short answer sub questions covering the entire syllabus. The remaining six questions each carrying 17 marks are to be set as suggested in the body of the syllabi.)

Linear equations with variable coefficients, the wronskian and linear independence, reduction of the order of a homogeneous equations, the non-homogeneous equations. Homogeneous equations with analytic coefficients. Linear equations with regular singular points, Eulers equations and series solutions. Existence and uniqueness of solutions of 1st order equations, exact equations, Picard's method of successive approximations, existence & uniqueness of solution to systems. (Chapter 3 (excluding section 8 & 9), chapter 4 (excluding sections 5, 7 & 8), chapter 5 (excluding section 7) and chapter 6 (sections 1,3,5,6) of Text book.1.

(Three questions are to be set)

Calculus of variations : Euler's equations, functions of the form

$\int_{x_0}^{x_1} F\left(x, y_1, y_2 \ldots . y_n, y_1, y_2, \ldots . y_n\right)$ dx. Functional dependence on higher order derivatives, variational problems in parametric form and applications (chapter VI of Text book.2).

Tensor Analysis: N-dimensional space, covariant and contravariant vectors, contraction, second & higher order tensors, quotient law, fundamental tensor, associate tensor, angle between the vectors, principal directions, christoffel symbols, covariant and intrinsic derivatives geodesics (chapter 1 to 4 of Text book.3).

(Three questions are to be set)

Text books:

1. E.A. Coddington. An Introduction to ordinary differential equations, Prentice Hall of India Pvt. Ltd., New Delhi, 1987.
2. L. Elsgolts: Differential equations and calculus of variations, Mir Publishers, Moscow,

M.Sc. FIRST SEMESTER APPLIED MATHEMATICS
AM 103: CLASSICAL MECHANICS
(With effect from 2007-2008 Admitted Batch)

Duration: 3 hours Maximum Marks: 85

(A total of seven questions are to be set and the student has to answer 5 (five) questions. All questions carry equal marks. The first question which is compulsory carries 17 marks. It consists of 4 short answer sub questions covering the entire syllabus. The remaining six questions each carrying 17 marks are to be set as suggested in the body of the syllabi.)

Lagrangian Formulation: Mechanics of a particle, mechanics of a system of particles, constraints, generalized cordinates generalized velocity, generalized force and potential. D'Alembert's principle and Lagranges equations, some applications of Lagrangian formulation, Hamilton's principle, derivation of Lagrange's equations from Hamilton's principle, extension of Hamilton's principle to non-holonomic systems, Advantages of variational principle formulation, conservation theorems and symmetry properties (scope and treatment as in Art.1.1 to 1.4 and Art 1.6 to 2.6 of Text book.1).

(Two questions are to be set)

Hamiltonian formulation: Legendre transformations and the Hamilton equations of motion, cyclic coordinates and conservation theorems, derivation of Hamilton's equations from a variational principle, the principle of least action, the equation of canonical transformation, examples of canonical transformation, Poisson and Lagrange brackets and their invariance under canonical transformation. Jacobi's identity; Poisson's Theorem. Equations of motion infinitesimal canonical transformation in the poisson bracket formulation. Hamilton Jacobi Equations for Hamilton's principal function, The harmonic oscillator problem as an example of the Hamilton – Jacobi method. (Art. 8.1, 8.2, 8.5, 8.6, 9.1, 9.2, 9.4, 9.5, 10.1, 10.2 of Text book.1)

(Three questions are to be set)

New concept of space and Time, postulates of special theory of relativity, Lorentz transformation equations, Lorentz contraction, Time dilation, simultaneity, Relativistic formulae for composition of velocities and accelerations, proper time, Lorentz transformations form a group (Scope and treatment is as in chapter 1 and 2 of Text book.2).

(One question is to be set)

Text books:

1. Classical mechanics by H.Goldstein, 2nd edition, Narosa Publishing House.
2. Relevant topics from Special relativity by W.Rindler, Oliver & Boyd, 1960.

M.Sc. FIRST SEMESTER APPLIED MATHEMATICS

AM-104: DISCRETE MATHEMATICAL STRUCTURES-I

(With effect from 2007-2008 Admitted Batch)

REVISED SYLLABUS

M.Sc. FIRST SEMESTER APPLIED MATHEMATICS

AM-104: DISCRETE MATHEMATICAL STRUCTURES-I

(With effect from 2007-2008 Admitted Batch)

Duration: 3 hours Maximum Marks: 85

(A total of seven questions are to be set and the student has to answer 5 (five) questions. All questions carry equal marks. The first question which is compulsory carries 17 marks. It consists of 4 short answer sub questions covering the entire syllabus. The remaining six questions each carrying 17 marks are to be set as suggested in the body of the syllabi.)

Algebraic systems: some simple algebraic systems – semi groups and monoids, homomorphism of semi-group and monoids, groups, subgroups and homomorphism, cosets and Lagranges theorem, normal subgroups. Sections 3-1, 3-2, 3-5.1, 3-5.2, 3-5.3 and 3-5.4 Chapter 3 of Text book.1).

Binary group codes, binary symmetric channels, encoding and decoding, block codes, matrix encoding techniques, group codes, decoding tables, and Hamming codes (chapter 8 of Text book.2)

(Three questions are to be set)

Relations and ordering: partially ordered relations, Partially ordered sets, representation and associated terminology. (Sections 2-3.1,2-3.2, 2-3.8, 2-3.9 of Chapter 2 in Text book1)

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 Text book.1).

Boolean Algebra, subalgebra, direct product and Homomorphism, Boolean forms and free Boolean Algebras, values of Boolean expressions and Boolean functions (Sections: 4-2.1, 4-2.2, 4-3.1, 4-3.2 of chapter of Text book 1)

(Three questions are to be set)

Text books:

1. Discrete Mathematical structures with Applications to Computer Science by J.P. Trembly and R.Manohar, Tata Mc.Grawhill Edition.
2. Modern Applied Algebra by G.Birkhoff. and Thomas C.Bartee

M.Sc. FIRST SEMESTER APPLIED MATHEMATICS
AM 105: NUMERICAL METHODS AND PROGRAMMING
(With effect from 2007-2008 Admitted Batch)

Duration: 3 hours Maximum Marks: 85

(A total of seven questions are to be set and the student has to answer 5 (five) questions. All questions carry equal marks. The first question which is compulsory carries 17 marks. It consists of 4 short answer sub questions covering the entire syllabus. The remaining six questions each carrying 17 marks are to be set as suggested in the body of the syllabi.)

Fortran 77 programming: Introduction, Flowcharts, Fortran programming preliminaries, Fortran constants and variables, Arithmetic expressions, Input-output statements, control statements, Do statements, Subscripted variables, Elementary format specifications. Logical variables and logical expressions, function subprograms, subroutine subprograms, simple examples on these topics (Scope and treatment as in chapters 3 to 12 and 14 of Text book.1).

(Three questions are to be set)

Numerical techniques of solving transcendental and polynomial equations: Bisection methods, secant method, Newton-Raphson method, Chebyshev method, Rate of convergence, Iteration methods of first and second orders. Methods for multiple roots. Numerical techniques of solving system of lineal Algebraic equations: Triangularization method, Gauss elimination method, Gauss-jordan method, 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 Rutishausher method (Scope and treatment as in chapters 2 and 3 of Text book.2).

(Three questions are to be set)

Text books:

1. V. Rajaraman, Computer programming in Fortran-77, 4th edition Prentice Hall of India Private Ltd.
2. Jain, S.R.K. Iyangar, R.K. Jain - Numerical Methods for Scientific and Engg. Computation, 3rd Edition, New Age international (P) Ltd. Publishers.

M.Sc. SECOND SEMESTER APPLIED MATHEMATICS
AM 201: COMPLEX ANALYSIS
(With effect from 2007-2008 Admitted Batch)

Duration: 3 hours Maximum Marks: 85

(A total of seven questions are to be set and the student has to answer 5 (five) questions. All questions carry equal marks. The first question which is compulsory carries 17 marks. It consists of 4 short answer sub questions covering the entire syllabus. The remaining six questions each carrying 17 marks are to be set as suggested in the body of the syllabi.)

Functions of a complex variable: Analytic functions and Harmonic functions, Cauchy – Riemann equations, Sufficient conditions.

Complex integration: Contour integration, Cauchy – Goursat theorem, antiderivatives, Integral representation for analytic functions, Theorems of Morera and Liouville and some applications.

Series: Uniform convergence of series, Taylor and Laurent series representations, singularities, Zeros and poles, Applications of Taylor and Laurent series.

(Three questions are to be set)

Residue theory: Residue theorem, calculus of Residues, evaluation of Improper real integral, Inderned contour integrals, Integrals with Branch point. Rouche's theorem.
Conformal mapping : Basic properties of conformal mapping, Bilinear transformations, mappings involving elementary functions.

(Three questions are to be set)

Text book: Complex analysis for Mathematics and Engineering – 3rd Edition by John H. Mathews and Russel W, Howell. Narosa publishing house (chapters: 3, 6, 7, 8 and 9).

M.Sc. SECOND SEMESTER APPLIED MATHEMATICS
AM 202: TECHNIQUES OF APPLIED MATHEMATICS-II
(With effect from 2008-2009 Admitted Batch)

Duration: 3 hours Maximum Marks: 85
(A total of seven questions are to be set and the student has to answer 5 (five) questions. All questions carry equal marks. The first question which is compulsory carries 17 marks. It consists of 4 short answer sub questions covering the entire syllabus. The remaining six questions each carrying 17 marks are to be set as suggested in the body of the syllabi.)

Partial differential equations: Equations of the form $\frac{dx}{P}=\frac{dy}{Q}=\frac{dz}{R}$, Orthogonal trajectories, Pfaffian differential equations, 1st order partial differential equations; Charpit's method and some special methods. Jacobi's method. Second order Partial differential equations with constant & Variable coefficients, canonical forms, separation of variables method, Monge's method (Chapter 1 (excluding sections 7 & 8), chapter-II (excluding section 14), chapter III (excluding section 10) of Text book.1).

(Three questions are to be set)

Integral equations: Basic concepts, solutions of integral equations, Volterre's integral equations and Fredholm's integral equations (Chapters: 1 & 2 of Text book 2)

(One question is to be set)

Fourier and Laplace Transforms with applications to ordinary, partial differential equations and Integral equations (Chapters 1,2,3,4,5,6 and 8 (section 8.1 & 8.2 only) of Text book 3)

(Two questions are to be set)

Text books:

1. I.N. Sneddon, Elements of partial differential equations. Mc Graw Hill International student Edition, 1964.
2. Shanti Swarup- Integral equations, Krishna Prakashan Media (P) Ltd, Meerut, 2003.
3. A.R.Vasishtha & R.K.Gupta, Integral transforms, Krishna Prakashan Media (P) Ltd, Meerut, 2003.

M.Sc. SECOND SEMESTER APPLIED MATHEMATICS

AM 203: Elements of Elasticity and Fluid Dynamics

(With effect from 2008-2009 Admitted Batch)

Duration: 3hrs. Max.Marks:85

A total of seven questions are to be set and student has to answer 5(Five) questions. All questions carry equal marks. The first question which is compulsory carries 17 marks. It consists of 4 short answer sub questions covering the entire syllabus. The remaining six questions each carrying 17 marks are to be set as suggested in the body of the syllabus.

Analysis of strain, deformation, affine deformation, infinitesimal affaine deformation, geometrical interpretation of the components of strain, principal directions, invariants, general infinitesimal deformation, Examples of strain, questions of compatibility

(Chapter 1 of Text book 1)

Analysis of stress, body and surface forces, stress tensor, equations of equilibrium, transformations of coordinates, stress quadric of Cauchy, Mohr's diagram, examples of stress. (Chapter 2 of Text book 1)

(Three questions are to be set)

Kinematics of fluids, real and ideal fluids, velocity of fluid at a point, streamlines and path lines, velocity potential, velocity vector, local and particle rates of change, equation of continuity, Acceleration of fluid conditions at a rigid boundary. General analysis of fluid motion.

(Chapter 2 of Text book 2)

Equation of motion of a fluid, pressure at a point in a fluid at rest and in a moving fluid conditions at a boundary of two in viscid immiscible fluids, Euler's equations of motion, Bernoulli's equation. Discussion of the case of steady motion under conservative body forces. Some potential theorems. Flows involving axial symmetry. Impulsive motion. Vortex motion, Kelvin's circulation theorem. Some further aspects of vertex motion.

(Chapter 3 of Text book 2)

(Three questions are to be set)

Text books:

1. Mathematical theory of Elasticity, by I.S.SOKOLNIKOFF

2nd edition; Tata Mc Graw Hill-New Delhi

2. Text book of Fluid dynamics by F.Chorlton, CBS publishers and distributors, New Delhi..

M.Sc. SECOND SEMESTER APPLIED MATHEMATICS
AM-204: DISCRETE MATHEMATICAL STRUCTURES-II
(With effect from 2007-2008 Admitted Batch)

Duration: 3 hours Maximum Marks: 85

(A total of seven questions are to be set and the student has to answer 5 (five) questions. All questions carry equal marks. The first question which is compulsory carries 17 marks. It consists of 4 short answer sub questions covering the entire syllabus. The remaining six questions each carrying 17 marks are to be set as suggested in the body of the syllabi.)

Mathematical logic: statements structures and notation, connectives, well formed formulas, tautologies, equivalences, implications, normal forms – Disjunctive and conjunctive, Principle disjunctive and conjunctive normal forms.
Theory of Inference: Theory of inferences for statement calculus, validity using truth tables, values of Inference. Predicate calculus: predicates, predicate formulas, quantifiers, free and bound variables, Inference theory of predicate calculus. (Scope and treatment as in Sections: 1.1 to 1.6 of Text book.1)

(Three questions are to be set)

Theory of Recursion: Recursive functions, primitive recursive functions, partial recursive functions and Ackerman's functions (scope and treatment as in Section 2-6.1 of Ref.1)
Graph Theory: Graphs and multigraphs, subgraphs, Isomorphism and homomorphism, paths, connectivity, traversable multigraph, labeled and weighted graphs; complete, regular and bipartite graphs, tree graphs, planar graphs.
Directed graphs: sequential representation of Directed graphs, shortest path, Binary trees, Complete and extended binary trees, Representation of binary trees; traversing binary trees and binary search tree (Scope as in Sections 8.2 to 8.9 of chapter 8, 9.2 to 9.7 of chapter 9 and 10.1 to 10.6 of chapter 10 of Text book.2).

(Three questions are to be set)

Text books:

1. Discrete Mathematical structures with Applications to Computer Science by J.P.Tremblay and R.Manohar Tata Mc Graw-Hill Edition.
2. Discrete Mathematics, Schaum's outline series, second edition, by Seymour Lipschutz and Marc Lipson Tata Mc Graw-Hill.

AM 205: ADVANCED NUMERICAL METHODS
(With effect from 2007-2008 Admitted Batch)

Duration: 3 hours Maximum Marks: 85
(A total of seven questions are to be set and the student has to answer 5 (five) questions. All questions carry equal marks. The first question which is compulsory carries 17 marks. It consists of 4 short answer sub questions covering the entire syllabus. The remaining six questions each carrying 17 marks are to be set as suggested in the body of the syllabi.)

Interpolation and Approximation: Lagrange interpolation, Hermite interpolation, Spline interpolation, Least squares approximation.
Numerical techniques for evaluating derivatives and integrals: Differentiation methods based on interpolation formulae, methods based on finite differences, extrapolation methods, partial differentiation. Numerical Integration methods based on interpolation formulae, Newton – Cote's methods, Trapezoidal and Simpsons formulae, Methods based on undetermined coefficients – Gauss Legendre, Gauss-Chebyshev integration methods, Lobatto integration, Composite integration methods – Trapezoidal rule, simpsons rule and Romberg integration. (Chapter 4 and 5 of Text book.1).

(Three questions are to be set)

Numerical techniques for solving ordinary differential equations: Euler method, backward Euler method, Midpoint method. Single step methods: Taylor series method, Runge-Kutta methods. Multistep methods: Predictor-corrector method, Adams Bashforth method, Adams –Moultan method, Convergence and stability analysis of single – step methods. (Chapter 6 of Text book.1)

Numerical methods for solving elliptic partial differential equations: Difference methods, Dirichlet problem, Laplace and Poisson equations. (Chapter 1.1, 1.2, 4.1 to 4.2 of Text book.2).

(Three questions are to be set)

Text books:

1. Numerical method for Scientific and Engineering Computation, M.K.Jain, S.R.K. Iyengar and R.K. Jain, 3rd edition, 1993, New Age International Pvt.Ltd.
2. Computational methods for partial differential equations by M.K. Jain, S.R.K.Iyengar and R.K. Jain, New Age International Pvt. Ltd. (1993).

M.Sc. THIRD SEMESTER APPLIED MATHEMATICS
AM-301: MEASURE THEORY
(With effect from 2007-2008 Admitted Batch)

Duration: 3 hours Maximum Marks: 85

(A total of seven questions are to be set and the student has to answer 5 (five) questions. All questions carry equal marks. The first question which is compulsory carries 17 marks. It consists of 4 short answer sub questions covering the entire syllabus. The remaining six questions each carrying 17 marks are to be set as suggested in the body of the syllabi.)

Lebesgue Measure: Introduction, Outer measure, Measurable sets and Lebesgue measure, A nonmeasurable set, Measurable functions, Littlewood's three principles.

The Lebesgue Integral: The Riemann integral, The Lebesgue integral of a bounded function over a set of finite measure. The integral of a nonnegative function. The general Lebesgue integral, Convergence in measure. (Cahpters 3 and 4 of the Text book).

(Three questions are to be set)

Differentiation and Integration: Differentiation of Monotone functions, Functions of bounded variation, Differentiation of an integral, Absolute continuity, Convex functions.

The classical Banach Spaces: The Lp spaces, The Holder and Minkowski inequalities, Convergence and completeness, Bounded linear functionals on the L_P spaces. (Chapters 5 and 6 of the Text book).

(Three questions are to be set)

Text Book: Real Analysis, H.L. Royden – Macmillan publishing Cp.

M.Sc. THIRD SEMESTER APPLIED MATHEMATICS
AM-302: TECHNIQUES OF APPLIED MATHEMATICS-III
(With effect from 2007-2008 Admitted Batch)

Duration: 3 hours Maximum Marks: 85

(A total of seven questions are to be set and the student has to answer 5 (five) questions. All questions carry equal marks. The first question which is compulsory carries 17 marks. It consists of 4 short answer sub questions covering the entire syllabus. The remaining six questions each carrying 17 marks are to be set as suggested in the body of the syllabi.)

The vibrating string, Boundary value problems of Mathematical Physics, Eigenvalues and Eigenfunctions, Eigenfunction Expansions, Upper and lower bounds of eigenfunctions. (Article: 3.5 to 3.9 of the Text book)
(One question is to be set)

Orthogonal co-ordinate systems, Separation of variables. Sturm – Liouville Problems Series Solutions of boundary value problems. (Article: 4.1 and 4.2 of the Text book)

(Two questions are to be set)

Greens functions: Non/homogenous boundary value problems. One dimensional Green's function. Generalized functions. Green's function in higher dimensions. Problems in unbounded regions. (Article: 5.1 to 5.5 of the Text book)

(Three questions are to be set)

Text Book: John W.Dettman, Mathematical Methods in Physics and Engineering, Mc.Graw Hill Book Company, Second edition. (1969).

M.Sc. THIRD SEMESTER APPLIED MATHEMATICS
AM 303: PROGRAMMING LANGUAGE-C
(With effect from 2007-2008 Admitted Batch)

Duration: 3 hours Maximum Marks: 85
(A total of seven questions are to be set and the student has to answer 5 (five) questions. All questions carry equal marks. The first question which is compulsory carries 17 marks. It consists of 4 short answer sub questions covering the entire syllabus. The remaining six questions each carrying 17 marks are to be set as suggested in the body of the syllabi.)

Data types, Operators and Some statements: Identifiers and key words, Constants, C operators, Type conversion.

Writing a Program in C: Variable declaration, Statements, Simple C Programs, Simple input statement, Simple output statement, Featutre of stdio.h.

Control statements: Conditional expressions: If statement, if-else statement, Switch statement, Loop statements: For loop, While loop, Do – while loop, Breaking control statements: Break statement, Continue statement, goto statement.

Functions and Program Structures: Introduction, Defining a function, Return statement, Types of Functions, Actual and formal arguments, Local Global variables. The scope of variables: Automatic Variables, Register Variables, Static Variables, External wariables, Recursive functions.

(Four questions are to be set)

Arrays: Array Notation, Array declaration, Array initialization, Processing with arrays, Arrays and functions, Multidimensional array, Character array.

Pointers: Pointer declaration, Pointer operator, Address Operator, Pointer expressions, Pointer arithmetic, Pointers and functions, Call by value, Call by reference, Pointers and arrays, Pointer and one dimensional array, Pointer and multidimensional array, Pointer and strings, Array of pointers, Pointers to pointers.

Structures, Unions: Declaration of Structure, Initializing a structure, Functions and Structures, Arrays of Structures, Arrays within a structure, Structure within a structure, Pointers and structures, Unions.

(Two questions are to be set)

Text book: Programming in C by D.Ravichandran, New Age International, 1998 Chapters: 1, 2,3,4,5,6, and 8.

M.Sc. THIRD SEMESTER APPLIED MATHEMATICS

AM-304: APPLIED GROUP THEORY-I

(With effect from 2007-2008 Admitted Batch)

Duration: 3 hours Maximum Marks: 85

(A total of seven questions are to be set and the student has to answer 5 (five) questions. All questions carry equal marks. The first question which is compulsory carries 17 marks. It consists of 4 short answer sub questions covering the entire syllabus. The remaining six questions each carrying 17 marks are to be set as suggested in the body of the syllabi.)

Group of transformations, Groups of symmetry of a square, the multiplication table, the rearrangement theorem, generators of finite group, direct product of groups, Isomorphism and Homomorphism, permutation groups, direct sum and direct product of matrices. Sec.1.1 to 1.7 and 2.5 of text book-1.

Representation theory of finite groups: Definition of a representation of a group. Invariant subspaces reducible and irreducible representation, Schur's lemmas and the orthogonality theorem. Characters of a representation, orthogonality of characters, Reduction of a reducible representation, criterion for irreducibility, the regular representation, Direct product of representation of a group, Representation of a direct product groups. (Section 3.1, 3.2, 3.3, 3.5, 3.6, 3.7, 3.10 and 3.11 of text book-1).

(Four questions are to be set)

The symmetry group: The characters of a group from that of a sub group, Frobenius formula for the characters of the symmetric group, Graphical methods, Lattice permutation, young patterns, young tableaux, graphical method for determining characters, calculation of characters by means of the Frobenius formula. The matrices of IR's of S_n, Yamanonchi symbols. (Section 7.1 to 7.7 of text book-2).

(Two questions are to be set)

Text Books:

1. Elements of group theory for physicists – A.W.Joshi (3rd edition) (Wiley east)

2. Group theory and its application to physical problems – M.Hamermesh. (Addision-wisley Pub.Com.).

M.Sc. THIRD SEMESTER APPLIED MATHEMATICS
AM 305: BOUNDARY VALUE PROBLEMS-I
(With effect from 2007-2008 Admitted Batch)

Duration: 3 hours Maximum Marks: 85

(A total of seven questions are to be set and the student has to answer 5 (five) questions. All questions carry equal marks. The first question which is compulsory carries 17 marks. It consists of 4 short answer sub questions covering the entire syllabus. The remaining six questions each carrying 17 marks are to be set as suggested in the body of the syllabi.)

Elementary Topology on Metric spaces: Mappings on metric spaces, Existence and uniqueness theorem via the principle of contraction. Continuation of solutions, Dependence of solutions on initial conditions and on parameters. (Chapter 2 of text book l) **(one question is to be set)**

General theory for linear first order system of equations, solution space, The non-homogeneous equation. The nth order linear homogeneous equation, The nth order non-homogeneous equation, The adjoint vector equation, The adjoint nth order equation, The relationship between scalar and vector adjoints. (Chapter 3 of text book l)

(one question is to be set)

Linear equation with constant coefficients, Real distinct eigenvalues, The general solution. Direct solutions, Real solutions associated with complex eigenvalues. (Chapter 4, Section: 4.1, 4.2, 4.3, of text book l)

The two point boundary value problem: The two point homogeneous boundary value problem, the adjoint boundary value problem, The non-homogeneous boundary value problem and Green's matrix. The nth order boundary value problem, The nth order adjoint boundary value problem, the nth order non-homogeneous boundary value problems and Green's function. Self-adjoint boundary value problem (Chapter 6 of text book l)

(Two questions are to be set)

Linear Control System: Controllability, Observability, Controllability and Polynomials, linear feed back, state observers, Relization of constant systems. (Chapter 4 of text book 2) **(Two questions are to be set)**

Text books:

1. Theory of Ordinary differential equations, Randal H.Cole Appleton-Century-Crafts, New York (1968)
2. Introduction to Mathematical Control Theory, S.Barnett, R.G.Camarol, Clarendon Press, 1985.

Reference book: Theory of Ordinary differential equations by E.A. Coddington and Normal Levinson, Tata Mcgraw Hill Inc., New York (1980)

M.Sc. THIRD SEMESTER APPLIED MATHEMATICS

AM 306: Elasticity – I

((With effect from 2008-2009 Admitted Batch)**]**

Time: 3 hrs **Max.Marks – 85**

A total of seven questions are to be set and student has to answer 5 (Five) questions. All questions carry equal marks. The first question which is compulsory carries 17 marks. It consists of 4 short answer sub questions covering the entire syllabus. The remaining six questions each carrying 17 marks are to be set as suggested in the body of the syllabus.

Dynamical equations of an isotropic elastic solid, the strain – energy function and its connection with hooks law, saint venants principle.

(Chapter 3 of Text book)

Extension, bending and Torsion: statement of problem, extension of beams by longitudinal forces, Beam stretched by its own weight, Bending of beams by terminal couples of elliptic cylinder, Torsion of a circular shaft, Torsion of cylindrical bars, stress function, Torsion of elliptical cylinder, simple solution of torsion problems, effect of grooves, Torsion of a rectangular beam and of a triangular prism., Solution of Torsion problems by means of conformal mapping, Application of conformal mapping.

(Chapter 4, sections 29 to 38 and 44, 45 of Text book)
(Three questions are to be set)

Two-dimensional elastostatic problems: plane deformation, plane stress, Generalized plane stress, plane elastostatic problems, Airy's stress function, General solution of Biharmonic equation, formulas for stresses and displacements, the structure of the functions $\phi(z)$ and $\varphi(Z)$, First and second boundary value problems in plane Elasticity, Remarks of existence and uniqueness of solutions, the role of conformal representation in plane problems of Elasticity, An elementary method of the basic problems for simply connected domains, solution of basic problems for a circular region.

(Chapter 5, sections 65 to 77 of Text book)
(Three questions are to be set)

Text book: 1. Mathematical theory of Elasticity by (I.S.SOKOLNIKOFF T M H EDITION)

M.Sc. THIRD SEMESTER APPLIED MATHEMATICS
Elective: AM307 – Fluid Dynamics – I
((With effect from 2008-2009 Admitted Batch)

Duration 3 hrs. **Max Marks: 85**

A total of seven questions are to be set and student has to answer 5(Five) questions. All questions carry equal marks. The first question which is compulsory carries 17 marks. It consists of 4 short answer sub questions covering the entire syllabus. The remaining six questions each carrying 17 marks are to be set as suggested in the body of the syllabus.

Two-dimensional flows stream function. The complex potential for two dimensional, irrotational incompressible flow complex velocity potentials for standard two-dimensional flows uniform stream, line source, line sink, line doublets, line vortices. Two-dimensional image system, the Miline-Thomson circle theorem, Applications of circle theorem, Blasius theorem, (Sections 5.1 to 5.9 of chapter 5 of Text book.1)

Some three dimensional flows, source, sinks and doublets, Images in a rigid infinite plane, and in solid sphere. Axi – symmetric flows, stokes stream function, some special forms of the stokes stream function for axi-symmetric irrotational motions.

(Chapter 4 of Text book 1)

(Three questions are to be set from the above topics)

Dynamics of real fluids, Introduction, Navier stokes equations of motions vorticity and circulation in a viscous fluid, exact solutions of N.S. equations unstead of flows.

(Sections 5.1 to 5.3 excluding 5.3.4 of Chapter 5 of the Text book 2)

Boundary layer theory, Introduction, Duration of two dimensional boundary layer equations, Integral equations of the boundary layer, Analytic solutions of the boundary layer equation. Flow parallel to a semi-infinite flat plate. Flow near the stagnation points of cymater.

(Sections 6.1, 6.2 and 6.3.1 and 6.3.2 of chapter 6 of Text book 2)

Text books 1. Textbook of fluid Dynamics by F.Chorlton, CBS publishers and distributors, New Delhi.

2. Modern Fluid Dynamics Vol. **1**. Incompressible flow by N curl and H.Davis D.Van No strand company Ltd., London.

M.Sc. THIRD SEMESTER APPLIED MATHEMATICS
ELECTIVE: 308 OPTIMIZATION TECHNIQUES-I
(With effect from 2007-2008 Admitted Batch)

Duration: 3 hours Maximum Marks: 85

(A total of seven questions are to be set and the student has to answer 5 (five) questions. All questions carry equal marks. The first question which is compulsory carries 17 marks. It consists of 4 short answer sub questions covering the entire syllabus. The remaining six questions each carrying 17 marks are to be set as suggested in the body of the syllabi.)

Linear Programming an its Applications: Formulation of L.P. problems, slack and surplus variables, convex sets, simplex method, artificial variables techniques, big M-method, degeneracy, revised simplex method. (Chapter I (expect 1,3),Chapter II, Chapter III, Chapter IV of unit 2 and Appendix – A of Unit-6 of text book 1)

(Two questions are to be set)

Duality in linear programming, the dual simplex method, Integer linear programming, Gomory's cutting plane method, branch and bound method (Chapter V, Chapter VI and Chapter VIII of unit –2 of text book 1)

(Two questions are to be set)

Assignment models, Hungarian method, the traveling salesman problem, transportation models, methods for initial basic feasible solutions, MODI method, degeneracy in transportation problems. (Chapter IX, Chapter X, of unit 2 of text book1)

Dynamic programming, concepts of dynamic programming, Bellman's principle of optimality, simple models (7.1 to 7.9 of Chapter VII of unit 5 of text book 1.)

(Two questions are to be set)

Text book: 1. S.D. Sharma, Operations research, Kedarnath Ramnath & Company.
Reference book: Linear Programming by G. Hadley, Oxford, IBH publishing Co

M.Sc. THIRD SEMESTER APPLIED MATHEMATICS
ELECTIVE: 309 RELATIVITY AND COSMOLOGY-I
(With effect from 2007-2008 Admitted Batch)

Duration: 3 hours Maximum Marks: 85
(A total of seven questions are to be set and the student has to answer 5 (five) questions. All questions carry equal marks. The first question which is compulsory carries 17 marks. It consists of 4 short answer sub questions covering the entire syllabus. The remaining six questions each carrying 17 marks are to be set as suggested in the body of the syllabi.)

Space-time continuum, the three plus one dimensions of space-time, the geometry corresponding to space-time, the signature of the line element and the three kinds of interval, Lorentz rotation of axes, transformation to proper coordinates. (Chapter II , Articles 13-18 of Text book 1)

(One question is to be set)

The mass of a moving particle, the transformation equations for mass, work and kinetic energy, the relations between mass, energy and momentum, Four-dimensional expressions of the mechanics of a particle (Chapter III , Articles 23-28 of Text book 1)

(One question is to be set)

The Maxwell-Lorentz Field Equations, The transformation equations for E, H and Q. The force on a moving charge, The energy and momentum of electromagnetic field, electromagnetic stresses, Four dimensional expressions for electron theory(Chapter IV, Articles 39-43 & 46 of Text book 1)

(Two questions are to be set)

Riemann Christoffel Tensor, covariant curvature tensor and its properties, Ricci Tensor, Curvature invariant, Einstein space, Bianchi's identity , Riemannian Curvature, Einstein space, flat space, space of constant curvature, for, Schur's Theorem (Chapter V of Text book 2)

(Two questions are to be set)

Text Books:

1. R.C. Tolman, Relativity , Thermodynamics and Cosmology, Clarendon Press, Oxford.
2. Bary Spain, Tensor Calculus-Radha Publishing House, Calcutta

Books for further reference:

3. Introduction to Special Relativity by Robert Resnick, Johnwiley & Sons. New York
4. Theory of Relativity by S.R. Roy and Raj bali Jaipur Publishing House, Jaipur.
5. J.K. Goyal and K.P. Gupta, Theory of Relativity, Krishna Prakasan Media(P) Ltd. Meerut

M.Sc. FOURTH SEMESTER APPLIED MATHEMATICS
AM-401: FUNCTIONAL ANALYSIS
(With effect from 2007-2008 Admitted Batch)

Duration: 3 hours Maximum Marks: 85

(A total of seven questions are to be set and the student has to answer 5 (five) questions. All questions carry equal marks. The first question which is compulsory carries 17 marks. It consists of 4 short answer sub questions covering the entire syllabus. The remaining six questions each carrying 17 marks are to be set as suggested in the body of the syllabi.)

Topological spaces: elementary concepts, open bases and open subbases, weak topologies, function algebras Co (X, R) and Co (X, C), compact spaces, product spaces, Tychonoff's theorem, separation concepts.

Banach spaces: definition and some examples, continuous linear transformations, the Hahn-Banach theorem, the natural imbedding of N in N**, the open mapping theorem, the conjugate of an operator. (Sections 16 to 23, 26, 27 and Chapter 9 of text book)
(Three questions are to be set)

Hilbert spaces: definition and some simple properties, orthogonal complements, orthonormal sets, the conjugate space H*, the adjoint of an operator, self-adjoint operators, normal and unitary operators, projections.

Finite-Dimensional Spectral Theory: matrices, determinants and the spectrum of an operator, the spectral theorem, a survey of the situation. (Chapters 10 and 11 of text book) **(Three questions are to be set)**

Text Book: G.F.Simons – Mc Graw Hill, Introduction to Topology and Modern Analysis.

M.SC. FOURTH SEMESTER
AM 402: STATISTICAL METHODS
(With effect from **2008-2009** Admitted Batch)

Duration: 3 hours **Maximum Marks: 85**
(A total of seven questions are to be set and the student has to answer 5 (five) questions. All questions carry equal marks. The first question which is compulsory carries 17 marks. It consists of 4 short answer sub questions covering the entire syllabus. The remaining six questions each carrying 17 marks are to be set as suggested in the body of the syllabi.)

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1. **Random variables, distribution functions, Mathematical expectation and Generating functions:**

One and two dimensional random variables (Discrete and Continuous), Distribution functions, joint and conditional distribution functions, probability mass function, probability density function, Transformation of Random variables.
Mathematical expectation, Moments of a distribution function, moment generating functions, characteristic functions and their properties, Chebychev inequality, probability generating functions. (Chapter 5, Chapter 6 except section 6.7 and Chapter 7-Sections 7.1, 7.2, 7.3, 7.5 and 7.9)
(One question is to be set on the above topics)

2. **Probability Distributions:**

Discrete Distributions-Binomial, Poisson and geometric distributions and their properties with applications. (Sections 8.1-8.5 and 8.7 of Chapter8)
Continuous distributions – Gamma, Beta, Cauchy, Normal distributions and their properties with applications
(Sections 9.1, 9.2, 9.5, 9.6,9.7 and 9.12 of chapter 9) (Two questions are to be set)

3. **Correlation and Regression:**

Correlation, Karl pearson's coefficient of correlation, Calculation of correlation coefficient for Bivariant frequency distribution, Spearman's rank correlation coefficient. Linear regression- regression coefficients and their properties, angle between regression lines, standard error of estimate, curvilinear regression.
(Chapter 10 and Chapter 11) (One question is to be set)

4. **Sampling Distributions:**

Sampling and Large sample Tests, Exact sampling distributions, χ^2, t, F distributions and their applications.
(Chapter -14, Chapter 15 up to 15.6.4 and Chapter 16 up to 16.6 except 16.4)
(Two questions are to be set)

TEXT BOOK: Fundamentals of Mathematical Statistics-S.C.Gupta and V.K.Kapoor, 11 edition Sultan Chand and Sons, New Delhi
REFERENCE: An introduction to probability theory and mathematical statistics – V.K.Rohatgi Wiley Eastern Ltd, New Delhi

AM 403: THEORETICAL COMPUTER SCIENCE
(With effect from 2007-2008 Admitted Batches)

Duration: 3 hours Maximum Marks: 85

(A total of seven questions are to be set and the student has to answer 5 (five) questions. All questions carry equal marks. The first question which is compulsory carries 17 marks. It consists of 4 short answer sub questions covering the entire syllabus. The remaining six questions each carrying 17 marks are to be set as suggested in the body of the syllabi.)

The Theory of Automata: Definition of an automata, Description of a Finite Automation, Transition Systems, Properties of Transition Functions, Acceptability of a string by a finite Automation, Non Deterministic finite State Machines, The Equivalence of DFA and NDFA, Mealy and Moore models, Minimization of Finite Automaton.

Formal Languages: Basic definitions and examples, Chomsky classification of Languages, Languages and their relation, Recursive and recursively enumerable sets, operations of languages, Languages and Automaton.

(**Three questions are to be set)**

Regular sets and Regular Grammars: regular expressions, Finite Automata and regular expressions, Pumping lemma for Regular sets, Application of Pumping lemma, Closure properties of regular sets, Regular sets and Regular grammars.

Context-free Languages: Context-free languages and derivation trees, Ambiguity in Context-free Grammars, Simplification of Context-free Grammars, Normal forms for Context-free Grammars.

Turing Machines: Turing Machine model, Representation of Turing Machines, Languages Acceptability by Turing Machines, Design of Turing Machines, Universal Turing Machines and other modifications.

(**Three questions are to be set)**

Text book: Theory of Computer Science (Automata, Languages and Computation) Chapters: 2,3,4,5.1 to 5.4 and 7.1 to7.5 By K.L.P. Mishra, N. Chandrasekharan, PHI, Second edition

M.Sc. FOURTH SEMESTER
ELECTIVE: AM 404: APPLIED GROUP THEORY-II
(With effect from 2007-2008 Admitted Batch)

Duration: 3 hours Maximum Marks: 85

(A total of seven questions are to be set and the student has to answer 5 (five) questions. All questions carry equal marks. The first question which is compulsory carries 17 marks. It consists of 4 short answer sub questions covering the entire syllabus. The remaining six questions each carrying 17 marks are to be set as suggested in the body of the syllabi.)

Semi groups, groups, languages and finite state machines, semi groups, products and quotients of semi groups, products and quotients of groups, languages, representation of special languages and grammars, semi groups, machines and languages, machines and Regular languages, simplification of machines. (Sections: 9.2, 9.3, 9.4, 9.5, 10.1, 10.2, 10.3, 10.4, 10.5, and 10.6 of text book – 1).

(One question is to be set)

2. Continuous groups and their representations: Topological groups and lie groups, axial rotation groups S0(2), Three dimensional rotation group S0(3), Unitary group U(2) and the special unitary group SU(2), Homomorphism of SU (2) on SO(3) generators of U(n) and SU(n), special unitary group SU(3), physical applications of SU(2) and SU(3). (Sections: 4.1, 4.2, 4.3, 4.5, 4.6, 4.8 of text book 2, Chapter 4).

(Two questions are to be set)

3. Crystallographic and molecular symmetry groups: Crystallographic point groups, Enumeration and their derivation, translation groups and space groups, molecular point groups, irreducible representations of point groups, double point groups, crystal field splitting of atomic level (Sections: 7.1, 7.2, 7.3, 7.4, 7.5 and 7.6 of text book 2.)

(Two questions are to be set)

4. Group theory in quantum mechanics: Rotation inversion group, Angular symmetry of wave functions and spherical harmonics, selection rules for atomic transitions, angular momentum in quantum mechanics, addition of two angular momenta, symmetrized combinations of eigen states. (Scope and treatment - Sections: 6.1.1, 6.1.2, 6.2.1, 6.2.2, 6.4.1, 6.4.2, of chapter 6 of the book 2).

(One question is to be set)

Text books:

1. Discrete Mathematical structures by Bernard Kolman, Robert Busby and Shoran
2. Elements of group Theory for physicists by A.W.Joshi, Wiley Edstern Limited. Third edition.

M.SC. FOURTH SEMESTER APPLIED MATHEMATICS

ELECTIVE : AM 405: BOUNDARY VALUE PROBLEMS-II

(With effect from 2007-2008 Admitted Batch)

Duration: 3 hours Maximum Marks: 85

(A total of seven questions are to be set and the student has to answer 5 (five) questions. All questions carry equal marks. The first question which is compulsory carries 17 marks. It consists of 4 short answer sub questions covering the entire syllabus. The remaining six questions each carrying 17 marks are to be set as suggested in the body of the syllabi.)

Stability of linear and weakly non-linear systems, continuous dependence and stability properties of linear, non-linear and weakly non-linear systems. Two dimensional systems. (chapter III of text book-1) **(Two questions are to be set)**

Stability by Liapunov second method, Autonomous systems, quadratic forms, Krasovski'sMethod. Construction of Liapunov functions for linear systems with constant coefficients. Selection of total energy function as a Liapunov Function, Stability based on first approximation (Chapter V of text book-1) **(One question is to be set)**

Mathematical Models in Population Dynamics: Introduction, single species Models, Two species Lotka volterra Models, Multi species Models. (chapter VI of text book-1) **(One question is to be set)**

Analysis and Methods of non-linear differential equations, Existence theorem, extremal solutions, upper and lower solutions. Existence via upper and lower solutions, Monotone iterative Method and Method of quasilinearlization, Bihari's inequality, Application of Bihari's integral inequality. Non-linear variation of parameters formula Alekseev's formula. (Chapter VI of text book-2) **(One question is to be set)**

Oscillations of second order equation, sturms comparison theorems Elementary linear Oscillations, comparison theorem of Hille Winter. (Chapter VIII of text book-2) **(One question is to be set)**

Text Books:

1. M.Rama Mohan Rao, Ordinary Differential equations, Theory methods and applications, Affiliated East-West Press Pvt.Ltd., New Delhi. (1980).
2. V.Lakshmikantam, S.G.Deo and V.Raghavendra, Text book of ordinary differential equations (second edition) Tata Mc Graw Hill, New Delhi. (1997).

ELECTIVE: AM 406-ELASTICITY-II
(With effect from 2008-2009 Admitted Batch)

Duration: 3 hours Maximum Marks: 85
(A total of seven questions are to be set and the student has to answer 5 (five) questions. All questions carry equal marks. The first question which is compulsory carries 17 marks. It consists of 4 short answer sub questions covering the entire syllabus. The remaining six questions each carrying 17 marks are to be set as suggested in the body of the syllabi.)

Two dimensional problems: General solutions, concentrated forces, definition of Elastic half-space by Normal loads, the problems of Boussinseq, spherical shell under external and internal pressers, spherical harmonics, Betti's method of integration., thermoelastic problems, thermal stresses in spherical bodies, Two dimensional thermoelastic problems, vibration of elastics solids, wave propagation in infinite regions, surface waves.

(Chapter 6, Section 90 to 95, 97, 99 to 104 of text book)

(Three questions are to be set)

Variational methods: Variational problems and Euler's equations, theorem of minimum potential energy, theorem of minimum complementary energy, theorems of Work and Reciprocity, Illustrative examples, variational problems related to the Biharmonic equation, The Ritz method. One dimensional case, The Ritz method. two dimensional case, galerkin method, Application to Torsion of Beams and deformation of plates, the method of Kantoroach

(Chapter 7, Section 105 to 113, 115 to 117 of text book)

(Three questions are to be set)

Text book: Mathematical theory of Elasticity -I.S.SOKOLINIKOFF (T M H edition)

M.SC. FOURTH SEMESTER APPLIED MATHEMATICS
AM 407: FLUID DYNAMICS-II
(With effect from 2008-2009 Admitted Batch)

Duration: 3 hours Maximum Marks: 85
(A total of seven questions are to be set and the student has to answer 5 (five) questions. All questions carry equal marks. The first question which is compulsory carries 17 marks. It consists of 4 short answer sub questions covering the entire syllabus. The remaining six questions each carrying 17 marks are to be set as suggested in the body of the syllabi.)

Flow of compressible fluids. Thermo dynamics and Physical properties of gases, equation of state, perfect gas, First and second law of thermodynamics entropy, Real gas, One dimensional flow of an inviscid compressible fluid, energy equation, velocity of sound, Mach number one dimensional steady flow in a nozzle, unsteady one dimensional flow, sound wave, Relation ship between pressure and velocity in isentropic flow, one dimensional steady flow with heat addition, formation of shock, Normal and oblique shockwaves in an ideal gas fundamental equations of a compressible inviscid, and non heat conducting fluid, Kelvin's theorem, irrotational motion two dimensional and axially symmetrical steady isentropic irrotational flow, method of small perturbations. Linearized theory, Two and three dimensional steady flows. Flow past an infinite wave shaped wall subsonic two dimensional flow over wall of arbitrary shape, Fourier integral method. (Scope and treatment as in Text book.1)

(Three questions are to be set)

Method of characteristics- applied to supersonic homentropic irrotational gas flow, Flow round a shape convex corner, Prandtl-Meyer expansion

Magneto hydro-dynamics introduction, Maxwell's field equations- medium at rest and in motion (No derivation) equations motion of a conducting fluid magnetic Reynolds number, Alfven's theorem, Magnetic body force. Ferraro's law of isorotation magneto hydro dynamic waves, Alfven waves steady flow of a viscous conducting fluid between parallel wall's in transverse magnetic field

(Three questions are to be set)

(Scope and treatment as in Text book.2.)

Text books:

1. Introduction to the theory of compressible Flow by S-I PAI
Van nostrand Rein hold, East-West press, New Delhi, Student Edition 1970
2. Text Book of Fluid Dynamics by F Chorlton, CBS publishers and Distributors
1985, Edition

M.Sc. FOURTH SEMESTER APPLIED MATHEMATICS

AM 408: OPTIMIZATION TECHNIQUES-II

(With effect from 2007-2008 Admitted Batch)

Duration: 3 hours Maximum Marks: 85

(A total of seven questions are to be set and the student has to answer 5 (five) questions. All questions carry equal marks. The first question which is compulsory carries 17 marks. It consists of 4 short answer sub questions covering the entire syllabus. The remaining six questions each carrying 17 marks are to be set as suggested in the body of the syllabi.)

Game Theory, Solution of Games with and without saddle points, minimax / maximini principle, principle of Dominance, matrix method for (m X n) Games without saddle point, algebraic method. (Chapter 1 of Unit 4(except 1.22))

(One question is to be set)

Inventory, classification inventory models, EOQ models with and without shortages, multi item deterministic models, dynamic demand Models.
(Chapter 2 of unit 4 (2.1 to 2.17))

(One question is to be set)

Replacement Models: Replacement of items that deteriates with time, individual replacement. Group replacement policies, recruitment and production problem. Equipment and renewal problem systems reliability. (Chapter 4 of unit 4)

(One question is to be set)

Queuing theory: distribution in queuing systems, poison process. Classification and solutions of Queuing model, models 1-4 (Chapter 5 of unit 4) (5.1 to 5.15)

(One question is to be set)

Jog Sequencing: Processing of n-jobs through $2/3/m^{machines}$ (Chapter 6 of unit 4)

(One question is to be set)

Net work analysis, PERT/ CPM Techniques network diagram representation time estimates and critical path in net work analysis, uses of PERT / CPM Techniques
(Chapter 07 of unit 4)

(One question is to be set)

Text book: Operations Research by S.D.Sarma (12 th Edition), kedarnath Ramnath and company.

M.Sc. FOURTH SEMESTER APPLIED MATHEMATICS
ELECTIVE: 409 RELATIVITY AND COSMOLOGY-II
(With effect from 2007-2008 Admitted Batch)

Duration: 3 hours Maximum Marks: 85

(A total of seven questions are to be set and the student has to answer 5 (five) questions. All questions carry equal marks. The first question which is compulsory carries 17 marks. It consists of 4 short answer sub questions covering the entire syllabus. The remaining six questions each carrying 17 marks are to be set as suggested in the body of the syllabi.)

The Fundamental Principles of General Relativity, Principle of Covariance, Principle of equivalence, Principle of Mach, Gravitational field in empty space, Gravitational field in the presence of matter and energy.

Simple consequences of principle of equivalence, Newton's theory as a first approximation. The Schwarzschild line element, the three crucial tests of Relativity.

(Chapter VI-Articles 72-75& 77-83 of Text book)

(Two questions are to be set)

Line elements for systems with spherical symmetry, static line element with spherical symmetry, schwarzschild exterior and interior solutions, Non-static line elements with spherical symmetry-Birkhoff's theorem. The generalized Lorentz Electron theory the field equations. The gravitational field of a charged particle. (Chapter VII-Articles 94-99,102 &107 of Text book)

(Two questions are to be set)

Application of general relativity to cosmology, The three possibilities for a homogeneous static universe, The Einstein line element, the de-sitter line element, Special relativity line element, The geometry of the Einstein universe, Density and pressure of material in Einstein universe. Behaviour of test particles and light rays in the Einstein universe, Comparison of Einstein model with actual universe. Geometry of the de-sitter universe. Absence of matter and radiation from de-sitter universe Behavior of test particles and light rays in the de-sitter universe.

(Chapter X-Articles 133-144 of Text book)

(Two questions are to be set)

Text Books:

Relativity, Thermodynamics and Cosmology, R.C. Tolman, Clarendon Press, Oxford.

Books for reference:

1. Lectures on General Relativity by T.M, Karade etal, sonu Nilu, 5 Bandu Soni Layout,
Gayatri Road, Parsodi, Nagpur-440 023.
2. Theory of Relativity by S.R. Roy and Raj bali, Jaipur Publishing House, Jaipur
3. Theory of Relativity by J.K. Goyal & K.P Gupta, Krishna Prakashan Media (P) Ltd. Meerut.

REVISED SYLLABUS
M.SC. THIRD SEMESTER APPLIED MATHEMATICS
LAB. IN C-LANGUAGE
(With effect from 2007-2008 Admitted Batch)
Duration: 2 Hours Maximum Marks: 50

1..Program to convert a given decimal number to octal number.

2.Program to solve quadratic equation using switchcase structure.

3.Program to check a given integer is a palindrome.

4.Program to check a given integer is a prime number.

5. Sorting of numbers.

6. Multiplication of two matrices.

7. Finding norm of a matrix using function.

8. Finding numerical integration using Simpson and Tripazodal rules.

9. Solving ODE by first order Adams bashforth method.

10. Solving ODE by forth order Runge Kutta method.

11. Program to check a given string is a palindrome or not.

12. Using pointers copying a string to another string.

13. Using pointers and functions sorting of number.

14. Compute binomical coefficients using recursive function for factorial.

M.SC. FIRST SEMESTER APPLIED MATHEMATICS
LAB. IN FORTRAN-77
(With effect from 2007-2008 Admitted Batch)
Duration: 2 Hours Maximum Marks: 50

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01. Program to solve quadratic equation.

02. Program to reverse a given integer and check it for palindrome.

03. Program to generate prime numbers.

04. Program to generate fibonacci sequence.

05. Sorting of numbers.

06. Program to compute trigonamatric functions.

07. Program to transpose a matrix.

08. Multiplication of two matrices.

09. Finding roots of a transcendential equation using N-R method.

10. Eigenvalue of a 3 X 3 real symmetric Matrix using Power method.

11. Sorting of numbers using functions in a 2-D array row wise.

12. Program to linear curve fitting.

13. Program to declare student result using logical variables.

14. Program to find inverse of a matrix.