DEENBANDHU CHHOTU RAM UNIVERSITY OF SCIENCE & TECHNOLOGY, MURTHAL

Department of Mathematics

Master of Science (M.Sc.) in Mathematics

Semester I

MAT 501B	Algebra	4 credits	4-0-0
MAT 503B	Real Analysis	4 credits	4-0-0
MAT 505B	Mechanics	4 credits	4-0-0
MAT 507B	Ordinary Differential Equations-I	4 credits	4-0-0
MAT 509B	Programming in C	4 credits	4-0-0
MAT 511B	Computing Lab	4 credits	0-0-4
	Total Credits	24 Credits	

Semester II

MAT 502B	Numerical Analysis	4 credits	4-0-0
MAT 504B	Measure & Integration Theory	4 credits	4-0-0
MAT 506B	Methods of Applied Mathematics	4 credits	4-0-0
MAT 508B	Ordinary Differential Equations-II	4 credits	4-0-0
MAT 510B	Complex Analysis	4 credits	4-0-0
MAT 512B	Numerical Computational Lab	4 credits	0-0-4
	Total Credits	24Credits	

Semester III

MAT 601 B	Topology	4 credits	4-0-0
MAT 603 B	Partial Differential Equation	4 credits	4-0-0
MAT 605B	Discrete Mathematics	4 credits	4-0-0
MAT 607B	Seminar	2 credits	0-0-2
	Elective-I	5 credits	5-0-0
	Elective-2	5 credits	5-0-0
	Total Credits	24 Credits	

Electives:

(Students are required to take both the electives from the same Group A or B or C)

Group-A

MAT 609B	Analytical Number Theory-I
MAT 611B	Abstract Algebra
MAT 613B	Algebraic Coding Theory-I

Group B

MAT 615B	Mechanics of Solids-I
MAT 617B	Fluid Mechanics
MAT 619B	Information Theory

Group C

MAT 621B	Fuzzy Systems
MAT 623B	Computer Networks

MAT 625 B Data Base Management System

Electives can be offered subject to availability of requisite resources/ faculty in the department

Semester IV

MAT 602 B	Functional Analysis	4 credits	4-0-0
MAT-604B	Data Structure	4 credits	4-0-0
MAT-606B	Differential Geometry	4 credits	4-0-0
MAT-608B	Seminar	2 credits	0-0-2
	Elective -3	5 credits	5-0-0
	Elective-4	5 credits	5-0-0
	Total Credits	24 credits	

Electives:
(Students are required to take both the electives from the same group D or E or F)
Group D (Prerequisites Group A)
MAT 610B Analytical Number Theory-II
MAT 612B Advanced Complex Analysis
MAT 614B Algebraic Coding Theory -II

Group E (Prerequisites Group B)
MAT 616B Mechanics of Solids-II
MAT 618B Optimization Techniques
MAT 620B Advanced Fluid Mechanics

Group F (Prerequisites Group C)
MAT 622B Artificial Intelligence
MAT 624B Computer Graphics
MAT 626B Software Engineering

Note: Electives can be offered subject to availability of requisite resources/ faculty in the department.

DEENBANDHU CHHOTU RAM UNIVERSITY OF SCIENCE &TECHNOLOGY
MURTHAL (SONEPAT) HARYANA - 131039
DEPARTMENT OF MATHEMATICS

SCHEME OF STUDIES & EXAMINATIONS

M.Sc. in Mathematics (Two Year Course)

Semester – I

Effective from Session 2009-2010

Paper No.	Paper title	Teaching Scheme			Examination Scheme			Duration of Exam.	Credit
		L	T	P	Sessional Marks	External Marks	Total		
MAT 501B	Algebra	4	0	0	50	100	150	3 Hours	4
MAT 503B	Real Analysis	4	0	0	50	100	150	3 Hours	4
MAT 505B	Mechanics	4	0	0	50	100	150	3 Hours	4
MAT 507B	Ordinary Differential Equations-I	4	0	0	50	100	150	3 Hours	4
MAT 509B	Programming in C	4	0	0	50	100	150	3 Hours	4
MAT 511B	Computing Lab	0	0	4	25	25	50	2 Hours	4
Total		20	0	4	275	525	800		24

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MURTHAL (SONEPAT) HARYANA - 131039
DEPARTMENT OF MATHEMATICS

SCHEME OF STUDIES & EXAMINATIONS

M.Sc. in Mathematics (Two Year Course)

Semester – II

Effective from Session 2009-2010

Paper No.	Paper title	Teaching Scheme			Examination Scheme			Duration of Exam	Credit
		L	T	P	Internal Marks	External Marks	Total		
MAT 502B	Numerical Analysis	4	0	0	50	100	150	3 Hours	4
MAT 504B	Measure & Integration Theory	4	0	0	50	100	150	3 Hours	4
MAT 506B	Methods of Applied Mathematics	4	0	0	50	100	150	3 Hours	4
MAT 508B	Ordinary Differential Equations-II	4	0	0	50	100	150	3 Hours	4
MAT 510B	Complex Analysis	4	0	0	50	100	150	3 Hours	4
MAT 512B	Numerical Computational Lab	0	0	4	25	25	50	2Hours	4
Total		20	0	4	275	525	800		24

DEENBANDHU CHHOTU RAM UNIVERSITY OF SCIENCE &TECHNOLOGY
MURTHAL (SONEPAT) HARYANA - 131039
DEPARTMENT OF MATHEMATICS

SCHEME OF STUDIES & EXAMINATIONS

M.Sc. in Mathematics (Two Year Course)

Semester – III

Effective from Session 2010-2011

Paper No.	Paper title	Teaching Scheme			Examination Scheme			Duration of Exam	Credit
		L	T	P	Internal Marks	External Marks	Total		
MAT 601B	Topology	4	0	0	50	100	150	3 Hours	4
MAT 603B	Partial Differential Equations	4	0	0	50	100	150	3 Hours	4
MAT 605B	Discrete Mathematics	4	0	0	50	100	150	3 Hours	4
MAT 607B	Seminar	2	0	0	50		50		2
	Elective-I	5	0	0	50	100	150	3 Hours	5
	Elective-II	5	0	0	50	100	150	3 Hours	5
Total		24	0	0	300	500	800		24

Electives:
(Students are required to take both the electives from the same Group A or B or C)

Group-A
MAT 609B Analytical Number Theory-I
MAT 611B Abstract Algebra
MAT 613B Algebraic Coding Theory-I
Group B
MAT 615B Mechanics of Solids-I
MAT 617B Fluid Mechanics
MAT 619B Information Theory
Group C
MAT 621B Fuzzy Systems
MAT 623B Computer Networks
MAT 625B Data Base Management System

***Note:* Electives can be offered subject to availability of requisite resources/ faculty in the department**.

DEENBANDHU CHHOTU RAM UNIVERSITY OF SCIENCE &TECHNOLOGY
MURTHAL (SONEPAT) HARYANA - 131039
DEPARTMENT OF MATHEMATICS

SCHEME OF STUDIES & EXAMINATIONS

M.Sc. in Mathematics (Two Year Course)

Semester – IV

Effective from Session 2010-2011

Paper No.	Paper title	Teaching Scheme			Examination Scheme			Duration of Exam	Credit
		L	T	P	Internal Marks	External Marks	Total		
MAT 602B	Functional Analysis	4	0	0	50	100	150	3 Hours	4
MAT 604B	Data Structure	4	0	0	50	100	150	3 Hours	4
MAT 606B	Differential Geometry	4	0	0	50	100	150	3 Hours	4
MAT 608B	Seminar	2	0	0	50		50		2
	Elective-III	5	0	0	50	100	150	3 Hours	5
	Elective-IV	5	0	0	50	100	150	3 Hours	5
Total		24	0	0	300	500	800		24

Electives:
(Students are required to take both the electives from the same group D or E or F)

Group D (Prerequisites Group A)
MAT 610B Analytical Number Theory-II
MAT 612 B Advanced Complex Analyses
MAT 614B Algebraic Coding Theory -II

Group E (Prerequisites Group B)
MAT 616B Mechanics of Solids-II
MAT 618B Optimization Techniques
MAT 620B Advanced Fluid Mechanics

Group F (Prerequisites Group C)
MAT 622B Artificial Intelligence
MAT 624B Computer Graphics
MAT 626 B Software Engineering

Note: Electives can be offered subject to availability of requisite resources/ faculty in the department.

MAT501B: ALGEBRA

L	T	P		
4	0	-	(4 Credits)	

Marks for External Exam	: 100
Marks for Internal Exam	: 50
Total	: 150
Duration of Exam	: 3 Hours

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

Unit-I

Normal, Subnormal series and Composition Series, Zassenhaus's lemma, Scheiers theorem, Jordan-Holder theorem (Abelian and Non-Abelian groups), Commutators and their properties, Hall-Witt identity, three subgroup lemma of P. Hall.

Unit-II

Nilpotent groups and their class of nilpotency, Upper and lower central series and their properties, Invariant (normal) and chief series, Solvable groups, Insolvability of Sn(n>4).

Unit-III

Extension Fields, Algebraic and transcendental extensions, algebraically closed field, Prime fields, Separable and inseparable extensions, Normal extensions, Finite fields and their construction, Primitive elements.

Unit-IV

Automorphisms of Extensions, Galois Group, Galois extension, Fundamental theorem of Galois Theory, Solutions of polynomial equations by radicals, Insolvability of the general equation of degree 5 by radicals, Constructions with ruler and compass.

References

1. I.N. Herstein, Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975.
2. P.B. Bhattacharya, S.K. Jain and S.R. Nag Paul, Basic Abstract Algebra (2^{nd} Edition), Cambridge University Press, Indian Edition, 1997.
3. M. Artin, Algebra, Prentice-Hall of India, 1991.
4. I.S. Luther and I.B.S. Passi, Algebra, Vol. I-Groups, Vol.II-Rings, Narosa Publishing House (Vol. I-1996, Vol. II-1999).
5. David S. Dummit and Richard M Foote, Abstract Algebra, Third Edition, John Wiley & Sons,Inc.USA.
6. Harvey E. Rose, A course on Finite Groups, UNIVERSITEXT, Springer New York (2009) .
7. Rudolf Lidl and Harald Niederreiter, Introduction to Finite Field and their Aplications, Cambridge University Press,Cambridge 1988.

MAT 503B: REAL ANALYSIS

L	T	P		
4	0	-	(4 Credits)	

Marks for External Exam	: 100
Marks for Internal Exam	: 50
Total	: 150
Duration of Exam	: 3 Hours

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

Unit -I

Sequences and series of functions, point-wise and uniform convergence, Cauchy criterion for uniform convergence, Weierstrass M-test, Abel's and Dirichlet's tests for uniform convergence, uniform convergence and continuity, uniform convergence and Riemann-Stieltjes integration, uniform convergence and differentiation.

Unit – II

Explicit and Implicit Functions, continuity, differentiability, partial derivatives, of higher orders, and equality, differentials of higher order, functions of functions, Taylor's theorem.

Unit - III

Definition and existence of Riemann-Stieltjes integral, properties of the integral, integration and differentiation, the fundamental theorem of Calculus, integration of vector-valued functions, rectifiable curves.

Unit - IV

Set functions, intuitive idea of measure, elementary properties of measure, measurable sets and their fundamental properties, Lebesgue measure of sets of real numbers, algebra of measurable sets, Borel sets, equivalent formulation of measurable sets in terms of open, closed F_s and G_d sets, non measurable sets.

References

1. W. Rudin, Principles of Mathematical Analysis (3^{rd} edition) McGraw-Hill, Kogakusha, 1976, International Student edition.
2. T.M.Apostol, Mathematical Analysis, Narosa Publishing House, New Delhi, 1985.
3. P.K. Jain and V.P. Gupta, Lebesgue Measure and Integration, New Age International (P) Limited, New Delhi, 1986 (Reprint 2000).
4. H.L. Royden, Real Analysis, Macmillan Pub. Cop. Inc. 4^{th} Edition, New York, 1993.

MAT 505B: MECHANICS

L	T	P		
4	0	-	(4 Credits)	

Marks for External Exam	: 100
Marks for Internal Exam	: 50
Total	: 150
Duration of Exam	: 3 Hours

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

Unit-I

Moments and products of Inertia, Theorems of parallel and perpendicular axes, principal axes, The momental ellipsoid, Equimomental systems, Coplanar distributions, Generalized coordinates, Holonomic and Non-holonomic systems, Scleronomic and Rheonomic sustems, Lagrange's equations for a holonomic system, Lagrange's equations for a conservative and impulsive forces, Kinetic energy as quadratic function of velocities, Generalized potential, Energy equation for conservative fields.

Unit -II

Hamilton's variables, Donkin's theorem, Hamilton canonical equations, Cyclic coordinates, Routh's equations, Poisson's Bracket, Poisson's Identity, Jacobi-Poisson equation, Hamilton's Principle, Principle of least action, Poincare Cartan Integral invariant, Whittaker's equations.

Unit -III

Jacobi's equations, Statement of Lee Hwa Chung's theorem, Hamilton-Jacobi equation, Jacobi's theorem, Method of separation of variables , Lagrange Brackets, Condition of canonical character of a transformation in terms of Lagrange brackets and Poisson brackets, Invariance of Lagrange brackets and Poisson brackets under canonical transformations.

Unit -IV

Gravitation: Attraction and potential of rod, disc, spherical shells and sphere, Laplace and Poisson equations, Work done by self-attracting systems, Distributions for a given potential, Equipotential surfaces, Surface and solid harmonics, Surface density in terms of surface harmonics.

References

1. F. Chorlton, A Text Book of Dynamics, CBS Publishers & Dist., New Delhi.
2. F.Gantmacher, Lectures in Analytic Mechanics, MIR Publishers, Moscow,1975.
3. Louis N. Hand and Janet D. Finch, Analytical Mechanics, Cambridge University Press,1998.

MAT 507B: ORDINARY DIFFERENTIAL EQUATION-I

L	T	P		
4	0	-	(4 Credits)	

Marks for External Exam	: 100
Marks for Internal Exam	: 50
Total	: 150
Duration of Exam	: 3 Hours

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

Unit-I

Initial-value problem and the equivalent integral eqauation, e-approximate solution, Cauchy-Euler construction of an e-approximate solution, Equicontinuous family of functions, Ascoli-Arzela theorem, Cauchy-Peano existence theorem.

Uniqueness of solutions, Lipschitz condition, Picard-Lindelof theorem for local existence and uniqueness of solutions, solution of initial-value problems by Picard method,

Unit-II

Total differential Equations: Condition of Integrability, Methods of Solution, Gronwall's differential inequality, comparison theorems involving differential inequalities, zeros of solutions, Riccati's Equation, Pruffer transformation, Lagrange's identity and Green's Formula for second-order equation

Unit-III

Sturms separation and comparison theorems. Sturm-Liouville boundary-value problems, properties of eigen values and eigen functions. Separation variable method for heat and wave equation (one dimensional) and Laplace equation in (two dimensional) in Cartesian system.

Unit-IV

Introduction solution of linear differential equation of second order, complete solution in terms of known integral, Removal of the first derivative, transformation of the equation by changing the independent variable, method of variation of parameters and method of operational factors.

References

1. E.A. Coddington and N. Levinson,Theory of Ordinary Differential Equations, Mc Graw Hill, NY, 1955.
2. G. Birkhoff and G.C. Rota, Ordinary Differential Equations, John Wiley and Sons Inc..NY, 1978.
3. S.L. Ross, Differential Equations, John Wiley and Sons Inc., NY, 1984.
4. W.E. Boyce and R.C. Diprima, Elementary Differential Eqluations and Boundary Value Problems, John Wiley and sons Inc., NY, 1986.
5. Philip Hartman, Ordinary Differential Equations, John Wiley & Sons, NY 1964.
6. Sharma and Gupta, Differential Equations, Krishana Parkashan, Meerut.

MAT 509B: PROGRAMMING IN C

L	T	P		
4	0	-	(4 Credits)	

Marks for External Exam	: 100
Marks for Internal Exam	: 50
Total	: 150
Duration of Exam	: 3 Hours

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

Unit -I

An overview of programming, Programming languages, C Character Set, Constants Variables and Keywords, Types of C Constants, Rules for constructing Integer, Real and Character constants, Types of C Variables, C Instructions and their Type Declaration, Integer and Float Conversions.
Unary Plus and Minus operator, Binary Arithmetic Operators, Arithmetic Assignment Operators, Increment and Decrement Operators, Common Operator, Relational Operators, Logical Operators, Bit Manipulation Operators, Bitwise Assignment Operators, Cast Operator, Size of Operators Conditional Operator, Memory Operators, Hierarchy of Operators.

Unit -II

The if Statement, Multiple Statements within if, if-else statement, Nested if-else and use of Logical operators, Switch statement.
The while Loop, for loop, Nesting of Loops, The break Statement, The continue Statement, The do-while Loop, Switch statement and goto statement.

Unit -III

Arrays– Declaring an array, Arrays and Memory, Initializing arrays, Multidimensional arrays, Strings and it's in built functions.
Functions –The basics, declarations and calls, type of functions, Function call by Value and call by Reference, passing Arrays as Function Arguments, Recursion.

Unit -IV

Pointers – Pointer Arithmetic, Accessing Array elements through Pointers, Passing Pointers as Function arguments, Arrays of pointers, Pointers to pointers.Macros with Arguments, Macros versus function, File Inclusion.Structures, Accessing Structure Elements and storing Structure Elements, Array of Structure, Uses of Structure and Union.

References

1. E. Balagurusamy, Programming in ANSI C, TATA Mc Graw Hill.
2. Gottfried Byrons , Programming in C, Schaum's Series.
3. Brain W. Kernighan & Dennis M. Ritchie, The C Programme Language 2nd Ed, ANSI Features) Prentice Hall 1989.
4. Peter A. Darnell and Phillip E. Margolis , C : A Software Engineering Approach, Narosa Publishing House (Springer International student Edition) 1993.

MAT 511B: COMPUTING LAB

L	T	P		
-	-	4 (4 Credits)	Marks for External Exam	: 25
			Marks for Internal Exam	: 25
			Total	: 50
			Duration of Exam	: 2 Hours

Practical will be based on the Theory paper MAT 509B: Programming in C.

MAT 502B: NUMERICAL ANALYSIS

L	T	P		
4	0	-	(4 Credits)	

Marks for External Exam : 100
Marks for Internal Exam : 50
Total : 150
Duration of Exam : 3 Hours

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

Unit -I

Numerical Errors, Round-off error, Truncation error, Absolute and relative error, error propagation. Nonlinear equations, Bisection method, Fixed point iterations, Newton's method and convergence analysis of the methods, Complex roots by Bairstow method, Newton's method for non-linear system of equations.

Unit -II

Forward, backward & central differences, Factorial notation, averaging operator, shift operator and relationship between various type of operators, Newton's forward & backward interpolation formula, Central difference interpolation formula, interpolation formula for unequal intervals, Hermite interpolation and cubic Spline interpolation.

Unit -III

Numerical differentiation using forward, backward and central difference formulas. Numerical integration, Newton's Cotes formula, Trapezoidal and Simpson's rules, Romberg integration, Gaussian quadrature, Richardson Extrapolation.

Unit -IV

IVP: Taylor series method, Euler and modified Euler methods, Runge-Kutta methods, Multistep methods, Predictor-Corrector Method Accuracy and stability, Solution for Stiff equations BVP: Shooting method, Finite Difference method, Finite elements methods (Collocation method, Galerkin method).

References

1. M.T. Heath, Scientific Computing: An Introductory Survey, McGraw Hill, 2002.
2. S.D. Conte and Carl de Boor, Elementary Numerical Analysis – An Algorithmic Approach, 3rd Edition, McGraw Hill, 1980.
3. Srimanta Pal, Numerical Methods, Principle, Analysis and Algorithms, Oxford University Press, 2009.
4. C.F. Gerald and P.O. Wheatley, Applied Numerical Analysis, 5th Ed , Addison Wesley, 1994.
5. E Balagurusamy, Numerical Methods, TMH .

MAT 504B: MEASURE AND INTEGRATION THEORY

L	T	P		
4	0	-	(4 Credits)	

Marks for External Exam	: 100
Marks for Internal Exam	: 50
Total	: 150
Duration of Exam	: 3 Hours

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

Unit – I

Measurable functions and their equivalent formulations, Properties of measurable functions. Approximation of measurable functions by sequences of simple functions, Measurable functions as nearly continuous functions, Egoroffs theorem, Lusin's theorem, Convergence in measure and F. Riesz theorem for convergence in measure, Almost uniform convergence.

Unit – II

Shortcomings of Riemann Integral. Lebesgue Integral of a bounded function over a set of finite measure and its properties, Lebesgue integral as a generalization of Riemann integral, Bounded convergence theorem, Lebesgue theorem regarding points of discontinuities of Riemann integrable functions,

Unit – III

Integral of non-negative functions, Fatou's Lemma, Monotone convergence theorem, General Lebesgue Integral, Lebesgue convergences theorem. Vitali's covering Lemma, Differentiation of monotonic functions,

Unit – IV

Functions of bounded variation and its representation as difference of monotonic functions.,Differentiation of indefinite integral. Fundamental Theorem of Calculus. Absolutely continuous functions and their properties.

References

1. Walter Rudin, Principles of Mathematical Analysis (3rd edition) McGraw-Hill, Kogakusha, 1976, International Student edition.
2. T.M.Apostol, Mathematical Analysis, Narosa Publishing House, New Delhi, 1985.
3. P.K. Jain and V.P. Gupta, Lebesgue Measure and Integration, New Age International (P) Limited Published, New Delhi, 1986 (Reprint 2000)
4. H.L. Royden, Real Analysis, Macmillan Pub. Co. Inc. 4th Edition, New York, 1993.
5. Walter Rudin, Real and Complex Analysis, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1966

MAT 506B: METHODS OF APPLIED MATHEMATICS

L	T	P		
4	0	-	(4 Credits)	

Marks for External Exam : 100
Marks for Internal Exam : 50
Total : 150
Duration of Exam : 3 Hours

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

Unit -I

Fourier Transforms – Definition and properties, Fourier transform of some elementary functions, convolution theorem, Application of Fourier transforms to solve ordinary & partial differential equations.

Unit -II

Curvilinear Co-ordinates: Co-ordinate transformation, Orthogonal Co-ordinates, Cartesian, Cylindrical and Spherical Co-ordinates, expressions for velocity and accelerations, ds, dv and ds^2 in orthogonal co-ordinates, Areas, Volumes and Surface areas in Cartesian, Cylindrical & Spherical co-ordinates in a few simple cases, Grad, Div, Curl, Laplacian in Orthogonal Co-ordinates, Contravariant and Co-variant components of a vector.

Unit -III

Sample spaces, random variables, Distribution and density distribution function, Marginal and conditional distribution, probability generating function, Characteristic function, Mathematics expectation, Moments, moment generating function, Binomial & Poison distributions as the discrete distributions, Uniform, Exponential, Normal as the continuous distributions.

Unit -IV

Correlation, Karl Pearson coefficient of correlation, Rank correlation, Tied rank, limit for rank correlation coefficient, Regression, lines of regression, regression curves, regression coefficients and its properties, angle between two lines of regression, correlation coefficient between observed and estimated value, weak law of large numbers, central limit theorem, t, f, and Chi-square as sampling distribution.

References

1. I.N Sneddon., The Use of Integral Transforms, McGraw Hill, 1972.
2. Murray and R.Spiegel, Vector Analysis, Schaum's Series.
3. S.C. Gupta and V.K Kapoor, Fundamentals of Mathematics Statistics, S. Chand & Sons, Educational Pub., New Delhi.

MAT 508B: ORDINARY DIFFERENTIAL EQUATION-II

L	T	P		
4	0	-	(4 Credits)	Marks for External Exam : 100
				Marks for Internal Exam : 50
				Total : 150
				Duration of Exam : 3 Hours

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

Unit -I

Linear systems, fundamental set and fundamental matrix of a homogeneous system, Wronskian of a system. Method of variation of constants for a non-homogeneous system, reduction of the order of a homogeneous system, systems with constant coefficients, adjoint systems, periodic solutions, Floquet theory for periodic systems (Relevant topics from the book by Coddington and Levinson).

Unit -II

Nonlinear differential equations, plane autonomous systems and their critical points, classification of critical points-rotation points, foci, nodes, saddle points. Stability, asymptotical stability and unstability of critical points, almost linear systems, Perturbations, Simple Critical points, dependence on a parameter.

Unit -III

Liapunov function, Liapunov's method to determine stability for nonlinear systems, limit cycles, Bendixson non-existence theorem, Statement of Poincare-Bendixson theorem, index of a critical point (Relevant topics from the books of Birkhoff & Rota, and by Ross).

Unit -IV

General Introduction of linear integral equations Fredholm and Volterra integral equation, Initial value problem and Boundary value problem, Solution of homogeneous Fredholm integral equations.

References

1. E.A.Coodington and N. Levinson. Theory of Ordinary Differential Equations, McGraw Hill, NY, 1955.
2. G.Birkhoff and G.C.Rota, Ordinary Differential Equations, John Wiley and Sons , NY, 1978.
3. S.L. Ross. Differential Equations, John Wiley and Sons inc., NY, 1984.
4. M.D. Raisinghania, Linear Integral equations, Kedar Nath Ram Nath, Meerut.
5. W.E. Boyce and R.C. Diprima, Elementary Differential Equations and Boundary Value Problems, John Wiley and Sons Inc., NY, 1986.
6. Philip Hartman, Ordinary Differential Equations, John Wiley & Sons, NY,1964.

MAT 510B: COMPLEX ANALYSIS

L	T	P		
5	0	-	(5 Credits)	

Marks for External Exam : 100
Marks for Internal Exam : 50
Total : 150
Duration of Exam : 3 Hours

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

Unit -I

Cauchy Riemann equiations, Necessary and sufficient conditions for a function to be analytic,Polar form of Cauchy Riemann equiations, Harmonic function ,Construction of analytical function, Power series, Radius of convergence of power series, Sum function of power series,Cauchy Hadamard theorem.

Unit -II

Complex Integration, Antiderivatives, Cauchy-Goursat Theorem, Simply and Multiply connected domains, Cauchy's Integral formula, Cauchy's Integral formula for higher Order derivatives, Morera's theorem, Cauchy's inequality, Liouville's theorem, The fundamental theorem of Algebra, Maximum Modulus Principle, Minimum Modulus Principle ,Schwarz Lemma, Poisson's integral formula.

Unit - III

Transformation: Jacobian Transformation, Conformal Transformation ,Some general transformations, Bilinear transformations and their properties and classification.

Unit -IV

Taylor's Series, Laurent's Series, Signularities, Meromorphic functions, Argument principle, Rouche's theorem,Calculus of residues, Cauchy's residue theorem, Evaluation of Integrals, Mittag Leffler's expansion theorem.

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 Publishing House, 1980.
3. L.V. Ahlfors, Complex Analysis, Mc Graw-Hill, 1979.
4. Mark J. Ablowitz and A.S. Fokas, Complex Variables: Introduction and Applications, Cambridge University Press, South Aisian Edition, 1998.
5. S. Ponnusamy, Foundations of Complex Analysis, Narosa Publishing House, 1997.
6. J.W. Brown and R.V. Churchill, Complex Variables and Applications, MC Graw Hill, 1996.

MAT 512B: Numerical Computational Lab

L	T	P		
-	-	4 (4 Credits)	Marks for External Exam	: 25
			Marks for Internal Exam	: 25
			Total	: 50
			Duration of Exam	: 2 Hours

Practical will be based on the Theory paper MAT 512B : Numerical Analysis

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MAT 601B: TOPOLOGY

L	T	P		
4	0	- (4 Credits)	Marks for External Exam	: 100
			Marks for Internal Exam	: 50
			Total	: 150
			Duration of Exam	: 3 Hours

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

Unit-I

Definition and examples of topological spaces, Comparison of topologies on a set, Intersection and union of topologies on a set, Neighborhoods, Interior point and interior of a set , Closed set as a complement of an open set , Adherent point and limit point of a set, Closure of a set, Derived set, Properties of Closure operator, Boundary of a set , Dense subsets, Interior, Exterior and boundary operators.

Base and subbase for a topology, Neighbourhood system of a point and its properties, Base for Neighbourhood system Relative(Induced) topology, Alternative methods of defining a topology in terms of neighbourhood system and Kuratowski closure operator.

Continuous functions, Open and closed functions , Homeomorphism ,Connectedness and its characterization.

Unit-II

Connected subsets and their properties, Continuity and connectedness, Connectedness spaces, Components, Locally connected spaces, Locally connected and product spaces.

First and Second Countable spaces and their hereditary and topological property, Lindelof's theorm, Separable spaces, Countability of a collection of disjoint open sets in separable and second countable spaces.

Unit- III

Separation axioms : T_0, T_1 and T_2 spaces their characterization and basic properties, Regular and normal spaces, Urysohn's Lemma and Tietze Extension theorem, T_3 and T_4 spaces, Complete regularity and Complete normality. $T_{3½}$ and T_5 spaces.

Unit - IV

Compact spaces and subsets, Compactness in terms of finite intersection property, Basic properties of compactness, Closedness of compact subset and a continuous map from a compact space into a Hausdorff space and its consequence. Sequentially and countably compact sets,Local compactness, Compactness and product space.

References

1. W.J. Pervin, Foundations of General Topology, Academic Press Inc. New York, 1964.
2. J.L. Kelley, General Topology, Van Nostrand, Reinholkd Co., New York, 1995.
3. James R Munkres, Topology, A First Course, Prentice Hall of India Pvt. Ltd., New Delhi, 2000.
4. George F. Simmons, Introduction to Topology and Modem Analysis, Mc Graw-Hill, Book Company, 1963.
5. J. Dugundji, Topology, Allyn and Bacon, 1966 (Reprinted in India by Prentice Hall Of India Pvt. Ltd.).
6. K.D. Joshi, Introduction to general Topology, Wiley Eastern Ltd.

MAT 603B: PARTIAL DIFFERENTIAL EQUATION

L T P	Marks for external exam :100
4 0 – (4 credits)	Marks for internal exam :50
	Total :150
	Duration of exam : 3hours

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

Unit -I

Solution of Partial Differential Equation. Transport equation-initial value problem, Non homogeneous equation. Laplace equation-fundamental solution, Mean value formulas, Properties of harmonic functions, Estimation on derivative, Harnack's inequality.

Unit -II

Green function, Energy methods, Heat equation-fundamental solution, Mean value formula, Properties of solution, Energy methods .Wave Equation-solution by spherical means, Application of D-Alembert's principle, Energy methods.

Unit -III

Nonlinear first order PDE- complete integrals, Envelopes, Characteristics, Hamilton Jacobi equations, Hamilton's ODE, Hopf-Lax formula, Weak solutions, Uniqueness. Representation of solutions.

Unit -IV

Separation of variables, Similarity solutions (Plain & Traveling waves solutions, Similarity under scaling), Fourier transform- Plancherel's theorem, Laplace transform, Legendere transform, Potential functions.

References

1. L.C. Evans, Partial Differential Equations, Graduate studies in mathematics, Volume-19, AMS, 1998.
2. I.N. Sneddon, Elements of Partial Differential Equations, McGraw Hill international
3. An Introduction to Partial Differential Equation Yehuda Pinchover and Jacob Rubinstein,Cambridge University press 2005

MAT 605B: DISCRETE MATHEMATICS

L T P	Marks for external exam :100
4 0 – (4 credits)	Marks for internal exam :50
	Total :150
	Duration of exam : 3hours

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

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Unit –I

Recurrence Relations, Explicit Formula for a Sequence, Solution of Recurrence Relations Homogeneous Recurrence Relations with Constant Coefficients, Particular Solution of a Difference Equation, Recursive Functions, Generating Functions, Convolution of Numeric Functions, Solution of Recurrence Relations by the Method of Generating Function.

Unit – II

The Pigeonhole Principle, Partially Ordered Sets, Hasse Diagram, Logics: Basic Logical Operations, Logical Equivalence Involving Tautologies and Contradictions, Conditional Propositions, Quantifiers, Lattices: Properties of Lattices, Lattices as Algebraic System, Lattice Isomorphism, Bounded, Complemented and Distributive Lattices.

Unit – III

Definitions and Basic Properties of Boolean Algebra, Representation Theorem, Boolean Expressions, Logic Gates and Circuits, Boolean Function, Method to find Truth Table of a Boolean Function , Karanugh map, Expressing Boolean Functions as Boolean Polynomials, Addition of Binary Digits, Half – Adder, Full Adder.

Unit – IV

Graphs: Basic concepts and types of Graphs, Paths and Circuits, Eulerian Circuits, Hamiltonian Circuits, Matrix Representation of Graphs, Planar Graphs, Trees: Definition, and Characterization of Trees Representation of Algebraic Expressions by Binary Trees, Spanning Tree of a Graph, Shortest Path Problem, Minimal Spanning Tree, Tree Searching.

References

1. Discrete Mathematics by Koleman, Busby & Rose, Pearson's Publication .
2. Discrete Mathematical Structures by C.L. Liu, Pearson's Publication .
3. Discrete Mathematics by Babu Ram, Pearson's Education, 2011.

MAT 607B: SEMINAR

L	T	P	
-	-	2(2 Credits)	

Marks for External Exam : -
Marks for Internal Exam : 50
Total : 50
Duration of Exam : -

MAT 609B: ANALYTICAL NUMBER THEORY –I

L	T	P		
5	0	-	(5 Credits)	Marks for External Exam : 100
				Marks for Internal Exam : 50
				Total : 150
				Duration of Exam : 3 Hours

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

Unit –I

Distribution of primes. Fermat's and Mersenne numbers, Congruences, Complete Residue System, Reduced Residue System and related results, Fermat Theorem, Wilson. Theorem (Relevant portions from the Books Recommended at Sr. No. 1 and 4).

Unit -II

Farey series and some results concerning Farey series. Approximation of irrational numbers by rationals, Hurwitz's theorem. Irrationality of e and p. Diophantine equations ax + by = c. $x^2+y^2 = z^2$ and $x^4+y^4 = z^4$. Simultaneous linear and non-linear congruences. Chinese Remainder Theorem and its extension. (Relevant portions from the Books Recommended at Sr. No. 1 and 4).

Unit -III

The representation of number by two or four squares. Four square theorem, Waring's problem, the numbers g(k) & G(k). Lower bounds for g(k) & G(k). (Relevant portions from the Books Recommended at Sr. No. 1 and 4).

Quadratic residues and non-residues. Legendre's Symbol. Gauss Lemma and its applications. Quadratic Law of Reciprocity. Jacobi's Symbol. (Scope as in Chapters 4,6 and 7 of Recommended Book at Sr. No.5).

Unit – IV

The arithmetic in Z_n. The group U_n. Congruences with prime power modulus, primitive roots and their existence. The group $U_p{}^n$ (p-odd) and $U_2{}^n$. The group quadratic residues Q_n, quadratic residues for prime power moduli and arbitrary moduli. The algebraic structure of U_n and Q_n (Scope as in Chapters 4,6 and 7 of Recommended Book at Sr. No.5).

References

1. G.H. Hardy and E.M. Wright, An Introduction to the Theory of Numbers, Clarendon. Press,Oxford,1962.
2. D.M.Burton, Elementary Number Theory, McGraw Hill Education,2006.
3. N.H.,McCoy, The Theory of Number, McMillian, New York,1965.
4. I.Niven and H.S. Zuckermann, An Introduction to the Theory of Numbers.
5. Gareth, A Jones and J. Mary Jones, Elementary Number Theory, Springer Ed. 1998.

MAT 611B: ABSTRACT ALGEBRA

L	T	P		
5	0	-	(5 Credits)	Marks for External Exam : 100
				Marks for Internal Exam : 50
				Total : 150
				Duration of Exam : 3 Hours

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

Unit-I

Simple classification of Abelian Groups, and structure of torsion groups, Prüfer groups, Steinitz Exchange Theorem, Finite Abelian groups, Fundamental structure theorem for finitely generated Abelian groups and its application to finitely generated Abelian groups. Divisible groups, Main theorem on p-Prüfer groups, Decomposition theorem for divisible groups**.**

Unit-II

Roots of unity and cyclotomic polynomials, nth cyclotomic field, composite and simple extensions with Galois Extensions, cyclotomic extensions and Abelian extensions over Q, Kronecker-Weber theorem, Galois groups of polynomials upto degree 5**.**

Unit-III

Canonical Forms, Similarity of linear transformations, Invariant subspaces, Reduction to triangular forms, Nilpotent transformations, Index of nilpotency, Invariants of a nilpotent transformation. The primary decomposition theorem, Jordan blocks and Jordan forms, Rational canonical form. Generalized Jordan form over any field.

Unit-IV

Cyclic modules, Free modules, Simple modules, Semi-simple modules, Schur's Lemma, Noetherian and Artinian modules and rings Hilbert basis theorem, Wedderburn-Artin theorem. Uniform modules, primary modules, and Noether-Lasker theorem.

References

1. Benjamin Baumslag, Bruce Chandler, Theory and Problems Of Group Theory, Schaum's Outline Series, McGRAW-HILL Book Company.
2. I.N. Herstein, Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975.
3. P.B. Bhattacharya, S.K. Jain and S.R. Nag Paul, Basic Abstract Algebra (2^{nd} Edition), Cambridge University Press, Indian Edition, 1997.
4. David S. Dummit and Richard M. Foote, Abstract Algebra, Third Edition, John Wiley & Sons,Inc.USA.
5. P.M. Cohn, Algebra, Vols. I, II & III, John Wiley & Sons, 1982, 1989, 1991.
6. N. Jacobson, Basic Algebra, Vols. I & II, W.H. Freeman, 1980.
7. I.S. Luther and I.B.S. Passi, Algebra, Vol. I-Groups, Vol.II-Rings, Narosa Publishing House, Vol. I-1996, Vol. II-1999.

MAT 613B: ALGEBRAIC CODING THEORY-I

L	T	P		
5	0	-	(5 Credits)	

Marks for External Exam	: 100
Marks for Internal Exam	: 50
Total	: 150
Duration of Exam	: 3 Hours

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

Unit-I

The communication channel. The Coding Problem. Types of Codes. Block Codes. Types of Codes such as Repetition codes, Parity Check Codes and their error-detection and correction capabilities. Hamming metric, Relationship of Error detection/correction with hamming distance, Maximum likelyhood decoding procedure, Decoding by Syndrome decoding and Coset Leaders, Standard Array.

Unit-II

Linear Codes(Binary and non binary), Minimum Distance , Dimension, Modular representation of linear codes. Description of Linear Codes by Matrices, Polynomial Codes, Generator and Parity Check Polynomials and Matrices.

Unit-III

Dual Codes, Self duality, Weight Distribution of dual of binary linear codes, Macwilliam Identity(binary case) Extending , Expurgating and Augmenting a code.
Lee Metric, Convolutional codes, Description using Matrices and Polynomials, Encoding using (4, 3,2) encoder.

Unit-IV

Hamming Codes (Binary and non-binary) and their properties. Perfect and quasi-perfect Codes. Golay Codes as perfect codes. Bounds on Minimum distance for block codes. Plotkin bound, Hamming Sphere packing bound. Gilbert- Varshamov Bounds.

References

1. Raymond Hill, A First Course in Coding Theory, Oxford University Press, 1986.
2. Man Young Rhee, Erropr Correcting Coding Theory, MC Graw Hill Incl., 1989.
3. W.W. Peterson and E.J. Weldon, Jr., Error-Correcting Codes. M.I.T. Press, Cambridge Massachuetts, 1972.
4. E.R. Berlekamp, Algebraic Coding Theory, MC Graw Hill Inc., 1968.
5. F.J. Macwilliams and N.J.A. Sloane, Theory of Error Correcting Codes, North-Holand Publishing Company.J.H. Van Lint, Introduction to Coding theory, Graduate Texts in Mathematics, 86, Springer, 1998.
6. L.R.Vermani, Elements of Algebraic Coding, Chapman and Hall, 1996.

MAT 615B: MECHANICS OF SOLIDS-I

L	T	P		
5	0	-	(5 Credits)	

Marks for External Exam	: 100
Marks for Internal Exam	: 50
Total	: 150
Duration of Exam	: 3 Hours

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

UNIT-I

Cartesian Tensor : Coordinate transformation, Cartesian Tensor of different order, Sum, difference and product of two tensors, Contraction theorem, Quotient law, Symmetric & Skewsymmetric tensors, Kronecker tensor, alternate tensor and relation between them, Scalar invariant of second order tensor, Eigen values & vectors of a symmetric second order tensor, Gradient, divergence & curl of a tensor field.

UNIT-II

Analysis of Strain : Affine transformations, Infinitesimal affine deformation, Geometrical interpretation of the components of strain, Strain quadric of Cauchy, Principal strains and invariants, General infinitesimal deformation, Saint-Venant's equations of Compatibility.

UNIT-III

Analysis of Stress : Stress tensor. Equations of equilibrium, Transformation of coordinates, Stress quadric of Cauchy, Principal stress and invariants, Maximum normal and shear stresses.

UNIT-IV

Equations of Elasticity : Generalised Hooke's law, Homogeneous isotropic media, Elastic moduli for isotropic media, Equilibrium and dynamic equations for an isotropic elastic solid, Strain energy function and its connection with Hooke's law, Beltrami-Michell compatibility equations, Saint-Venant's principal.

References

1. I.S. Sokolnikoff, Mathematical Theory of Elasticity, Tata Mc Graw Hill Publishing Company Ltd., New Delhi, 1977.
2. Shanti Narayan, Text Book of Cartesian Tensors, S. Chand & Co., 1950.
3. S. Timoshenko and N. Goodier, Theory of Elasticity, Mc Graw Hill, New York, 1970.
4. A.E.H.Love, A Treatise on the Mathematical Theory of Elasticity, Cambridge University Press,London,1963.

MAT617B: FLUID MECHANICS

L	T	P		
5	0	-	(5 Credits)	

Marks for External Exam	: 100
Marks for Internal Exam	: 50
Total	: 150
Duration of Exam	: 3 Hours

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

UNIT-I

Kinematics of fluid- Lagrangian and Eulerian methods, Stream lines, Path lines, Streak lines, Velocity potential, Irrotational and rotational motions, Vortex lines, Equation of Continuity, Lagrangian and Eulerian approach, Euler's equation of motion, Bernoulli's theorem.

UNIT-II

Kelvin circulation theorem, Vorticity equation, Energy equation for an incompressible flow, Boundary conditions, Kinetic energy of liquid, Axially symmetric flows, Motion of a sphere through a liquid at rest at infinity, Liquid streaming past a fixed sphere, Equation of motion of a sphere.

UNIT-III

Sources, Sinks and doublets, Images in a rigid impermeable infinite plane and in impermeable spherical surfaces, Two-dimentional irrotational motion produced by motion of circular, co-axial and elliptic cylinders in an infinite mass of liquid.

UNIT- IV

Stream functions, Stokes stream functions, Complex velocity potential, Conformal mapping, Milne-Thomson Circle theorem, Blasius theorem, Vortex Motion and its elementary properties, Kelvin's proof of permanence, Motion due to rectilinear vortices.

References

1. W.H. Besaint and A.S. Ramsey, A Treatise on Hydromechanics, Part-II, CBS Publishers, Delhi, 1988.
2. F. Chorlton, Textbook of Fluid Dynamics, C.B.S. Publishers, Delhi, 1985.
3. S.W. Yuan, Foundatiojns of Fluid Mechanics, Prentice Hall of India Private Ltd. Delhi, 1976.
4. M.E. O'Neil and F. Chorlton, Ideal and Incompressible Fluid Dynamics, John Wiley & Sons, 1986.

MAT-619B: INFORMATION THEORY

L	T	P		
5	0	-	(5 Credits)	

Marks for External Exam : 100
Marks for Internal Exam : 50
Total : 150
Duration of Exam : 3 Hours

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

Unit-I

Measure of information – Axioms for a measure of uncertainty. The Shannon entropy and its properties. Joint and conditional entropies. Transformation and its properties.

Unit-II

Noiseless coding – Ingredients of noiseless coding problem. Uniquely decipherable codes. Necessary and sufficient condition for the existence of instantaneous codes. Construction of optimal codes.

Unit-III

Discrete Memoryless Channel – Classification of channels. Information processed by a channel. Calculation of channel capacity. Decoding schemes. The ideal observer. The fundamental theorem of Information Theory and its strong and weak converses.

Unit-IV

Some intuitive properties of a measure of entropy – Symmetry, normalization, expansibility, boundedness, recursivity, maximality, stability, additivity, subadditivity, nonnegativity, continuity, branching, etc. and interconnections among them. Axiomatic characterization of the Shannon entropy due to Shannon and Fadeev.

References

1. R. Ash, Information Theory, Interscience Publishers, New York, 1965.
2. F.M. Reza, An Introduction to Information Theory, Mc Graw Hill Book Company Inc., 1961.
3. J. Aczel and Z. Daroczy, On Measures of Information and their Characterizations, Academic Press,New York,1975.

MAT 621B: FUZZY SYSTEMS

L	T	P		
5	0	- (5 Credits)	Marks for External Exam	: 100
			Marks for Internal Exam	: 50
			Total	: 150
			Duration of Exam	: 3 Hours

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

Unit-1

Introduction, Basic Types, Basic Concepts, Representations of Fuzzy Sets, Extension Principlefor Fuzzy Sets, Types of Operations. Fuzzy Complements, Fuzzy Intersections: t-Norms., Fuzzy Unions: t-Conorms, Combinations of Operations. Aggregation Operations. Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals, Arithmetic Operations on Fuzzy Numbers, Fuzzy Equations.

Unit-1I

Crisp versus Fuzzy Relations, Projections and Cylindric Extensions, Binary Fuzzy Relations, Binary Relations on a Single Set. Fuzzy Equivalence Relations, Fuzzy Compatibility Relations. Fuzzy Ordering Relations, Fuzzy Morphisms, Sup-i Compositions of Fuzzy Relations., Inf-Compositions of Fuzzy Relations.

Unit-III

Fuzzy Measures, Fuzzy Sets and Possibility Theory, Classical Logic: An Overview. Multivalued Logics. Fuzzy Propositions. Fuzzy Quantifiers. Linguistic Hedges. Inference from Conditional Fuzzy Propositions. Inference from Conditional and Qualified Propositions. Inference from Quantified Propositions, Information and Uncertainty, Nonspecificity of Fuzzy Sets. Fuzziness of Fuzzy Sets. Principles of Uncertainty.

Unit-IV

Fuzzy Expert Systems: An Overview. Fuzzy Implications. Selection of Fuzzy Implications. Multiconditional Approximate Reasoning. The Role of Fuzzy Relation Equations, Fuzzy Controllers:

Reference

1. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic, PHI
2. Witold Pedrvcz and Femando Gomide, An Introduction to Fuzzy Sets, PHI

MAT 623B: COMPUTER NETWORKS

L	L	T	P		
5	0	-	(5 Credits)	Marks for External Exam	: 100
				Marks for Internal Exam	: 50
				Total	: 150
				Duration of Exam	: 3 Hours

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

Unit-I

Introduction Concepts: Goals and Applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design - Delay Analysis, Back Bone Design, Local Access Network Design. Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling.

Unit-II

Medium Access sub layer: Medium Access sub layer - Channel Allocations, LAN protocols -ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols, Sliding Window protocols, Error Handling.

Unit –III

Network Layer: Network Layer - Point - to Pont Networks, routing, Congestion control Internetworking -TCP / IP - IP packet, IP address, IPv6.

Transport Layer: Transport Layer - Design issues, connection management, session Layer-Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques.

Unit IV

Application Layer: Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application, Example Networks - Internet and Public Networks.

References

1. William Stallings, Data and Computer Communications, 7th Edition, Pearson Education, 2004.
2. Behrouz A. Forouzan, Data Communications and Networking, 3rd Edition, TMH, 2004.
3. James F. K. and W. Ross, Computer Networking: A Top-Down Approach Featuring the Internet,2nd Edition, Pearson Education, 2002.
4. Andrew S. Tanenbaum, Computer Networks, 4th Edition, Pearson Education, 2003.
5. S. Keshav, An Engineering Approach to Computer Networking, Pearson Education, 1997.
6. Ddouglas e. Comer, . Computer Networks and Internets with Internet Applications, 4th Edition,Pearson Education, 2003.

MAT 625B: DATA BASE MANAGEMENT SYSTEM

L	T	P		
5	0	-	(5 Credits)	Marks for External Exam : 100 Marks for Internal Exam : 50 Total : 150 Duration of Exam : 3 Hours

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

Unit-I

Introduction: An overview of database management system, database system Vs file system, Database system concepts and architecture, data models schema and instances, data independence and data base language and interfaces, Data definitions language, DML, Overall Database Structure.

Unit-II

Data Modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationships of higher degree.

Unit-III

Relational data Model and Language: Relational data model concepts, integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra.

Introduction to SQL: Characteristics of SQL. Advantage of SQL. SQL data types and literals. Types of SQL commands. SQL operators and their procedure. Tables, views and indexes. Queries and sub queries. Aggregate functions. Insert, update and delete operations. Joins, Unions, Intersection, Minus.

Unit-IV

Data Base Design & Normalization: Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion Dependences.

Transaction Processing Concepts: Transaction system, Testing of serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling.

Concurrency Control Techniques: Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi version schemes, Recovery with concurrent transaction.

References

1. C. J. Date, An Introduction To Database System, Addision Wesley.
2. H.F.Korth, Silbertz and S. Sudarshan, Database Concepts, McGraw Hill.
3. Elmasri, Navathe, Fundamentals Of Database Systems, Addision Wesley.
4. Leon & Leon, Database Management System, Vikas Publishing House.
5. Bipin C. Desai, An introduction to Database Systems, Galgotia Publication.
6. Majumdar & Bhattacharya, Database Management System, TMH.

MAT 602B: FUNCTIONAL ANALYSIS

L	T	P		
4	0	-	(4 Credits)	

Marks for External Exam : 100
Marks for Internal Exam : 50
Total : 150
Duration of Exam : 3 Hours

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

Unit-I

Normed linear spaces, metric on normed linear spaces, Holder's and Minkowski's inequality, completeness of quotient spaces of normed linear spaces, Completeness of I_p, L^p, R^n, C^n and C[a,b]. Bounded linear transformation, Equivalent formulation of continuity, Spaces of bounded linear transformation,Continuous linear functional, conjugate spaces.

Unit-II

Fundamental Theorems, Hahn Banach extension theorem (Real and Complex form) Riesz representation theorem for bounded linear functional on L^p and C [a,b] and their consequences, Second Conjugate spaces, Reflexive spaces, uniform boundedness principle and its consequence, open mapping theorem and its application, projections, closed graph theorem Equivalent norms.

Unit-III

Compact operators and its relation with continuous operators, compactness of linear transformation on a finite dimensional space, properties of compact operators, compactness of the limit of the sequence of compact operators, Fixed point, Banach Contraction Principle and its application to solve Matrix equation, Differential Equations, Picard's Theorem and Picard-Lindeloff Theorem.

Unit-IV

Inner product spaces, Hilbert spaces Schwarz's inequality, Hilbert space as normed linear space, convex sets in Hilbert spaces. Projection theorem, orthonormal systems and Gram-Schmidt Orthogonalization Process, Bessel's inequality, Parseval's identity, Conjugate of a Hilbert space, Riesz representation theorem for continuous functional on a Hilbert space.

References:

1. E. Kreyszig, Introductory Functional Analysis with Applications, John Wiley & Sons, New York, 1978.
2. A.E. Taylor, Introductin to Functional Analysis, John Wiley and Sons, New York, 1958.
3. K. Yosida, Functional Analysis, 3rd edition Springer Verlag, New York, 1971.
4. Walter Rudin, Functional Analysis, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1973.
5. A.H.Siddiqi, Khalil Ahmad, P. Manchanda, Intoduction to Functional Anaiysis with Applications, Anamaya Publishers, New Delhi.

MAT-604B: DATA STRUCTURES

L	T	P		
4	0	- (4 Credits)	Marks for External Exam	: 100
			Marks for Internal Exam	: 50
			Total	: 150
			Duration of Exam	: 3 Hours

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

Unit - I

Introduction, Elementary data organization, data structure, data structure operations, time-space tradeoff, complexity of algorithms, Arrays: introduction, linear arrays, representation of linear arrays in memory, traversing linear arrays, inserting and deleting, sorting (bubble sort), searching (linear search) .

Unit- II

Linked lists: Definition, representation of linked lists in memory, traversing and searching a linked list, memory allocation (garbage collection), insertion into & deletion from a linked list, Stacks: definition, array and linked representation of stacks, Polish notation, quicksort as an application of stacks.

Unit- III

Trees: Definition, binary trees, complete binary trees, representing binary trees in memory(linked & sequential representation of binary tress), traversing binary trees, traversal algorithms using stack(preorder, inorder, postorder), binary search trees, searching and inseraching in binary search trees, heap, heapsort.

Unit- IV

Graphs: Graph theory terminology, sequential representation of graphs (adjacency matrix, path matrix), Warshall's algorithm (shortest paths), linked representation of a graph, operation on graphs(searching, insertion, deletion), traversing a graph(breadth first search, depth first search) .

References

1. Data Structures and Algorithms by A.V. AHo, J.E. Hopcroft and T.D. Ullman, Original edition, Addision-Wesley, 1999, Low Priced Edition.
2. Fundamentals of Data structures by Ellis Horowitz & Sartaj Sahni, Pub, 1983,AW
3. Fundamentals of computer algorithms by Horowitz Sahni and Rajasekaran.
4. Data Structures by Seymour Lipschutz & G A Vijayalakshmi Pai, Tata McGraw-Hill publishing Company Ltd, 2006

MAT 606B: DIFFERENTIAL GEOMETRY

L	T	P		
4	0	- (4 Credits)	Marks for External Exam Marks for Internal Exam Total Duration of Exam	: 100 : 50 : 150 : 3 Hours

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

UNIT-I

Curves With Torsion:Tangent, Osculating Plane,Rectifying Plane,Curvature,Principal Normal,Binormal,Torsion,Serret Frenet Formula,Locus of Center of Spherical Curvature.

UNIT-II

Envelopes: Surfaces, Tangent Plane, Envelope, Characteristics, Edge of Regression (Section1-6, 13-16 of Weatherburn's Book).

UNIT-III

Curvilinear co-ordinates: First order magnitude, Directions on a surface, Second order magnitude, Derivative of unit normal, Principal directions and curvature.

UNIT-IV

Geodesics: Geodesic Property, Equation of Geodesics, Torsion of a Geodesic (Section22-27, 29-30, 46, 47 and 49 of Weatherburn's Book).

References

1. C.E. Weatherburn, Differential geometry of Three Dimensions, Cambridge University Press, 1927.
2. Discrete Differential-Geometry Operators for Triangulated 2-Manifolds Meyer et al.,'02

MAT 608B: SEMINAR

L	T	P	
-	-	2(2 Credits)	

Marks for External Exam : -
Marks for Internal Exam : 50
Total : 50
Duration of Exam : -

MAT 610B: ANALYTICAL NUMBER THEORY-II

L	T	P		
5	0	- (5 Credits)	Marks for External Exam	: 100
			Marks for External Exam	: 50
			Total	: 150
			Duration of Exam	: 3 Hours

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

Unit-I

Riemann Zeta Function $\zeta(s)$ and its convergence. Application to prime numbers. $\zeta(s)$ as Euler's product. Evaluation of $\zeta(2)$ and $\zeta(2k)$. Dirichlet series with simple properties. Eulers products and Dirichlet products, Introduction to modular forms (Scope as in Chapters 8 and 9 of Recommended Book at Sr. No. 5).

Unit-II

Algebraic numbers and Integers : Gaussian integers and their properties. Primes and fundamental theorem in the ring of Gaussian integers. Integers and fundamental theorem in Q (ω) where $\omega^3 = 1$. Algebraic fields. Primitive polynomials.

Unit-III

The general quadratic field Q(vm), Units of Q(v2). Fields in which fundamental theorem is false. Real and complex Euclidean fields. "Fermat's theorem", i^{th} ring of Gaussian integers. Primes of Q(v2) and Q(v5). Series of Fibonacci and Lucas. Luca" test for the primality of the mersenne primes. (Relevant sections of Recommended Book at Sr. No. 1).

Unit-IV

Arithmatic functions $\phi(n)$, r(n), s(n) and s_k (n), u(n), N(n),I(n). Definition and examples and simple properties. Perfect numbers the Mobius inversion formula. The Mobius function μ_n, the order and average order of the function $\phi(n)$, r(n), s (n). The functions $\Lambda(n)$, ψ (n) and $\vartheta(n)$ Bertrand Postulate, Merten's theorem, Selberg's theorem and Prime number theorem (Scope as in Chapter 8 of Recommended Book at Sr. No. 5 and recommended Books at Sr. No.1 and 4).

References

1. G.H. Hardy and E.M.,Wright, An Introduction to the Theory of Numbers, Clarendon. Press,Oxford,1962.
2. D.M.Burton, Elementary Number Theory, McGraw Hill Education,2006.
3. N.H.McCoy, The Theory of Number, McMillian, New York,1965.
4. I.Niven and H.S. Zuckermann, An Introduction to the Theory of Numbers
5. Gareth, A Jones and J Mary Jones, Elementary Number Theory, Springer Ed. 1998.

MAT-612 B: Advanced Complex Analysis

L	T	P		
5	0	-	(5 Credits)	

Marks for External Exam	: 100
Marks for Internal Exam	: 50
Total	: 150
Duration of Exam	: 3 Hours

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

Unit -1

Spaces of Analytic functions, Hurwitz's theorem, Montel's theorem, Riemann mapping theorem, Weierstrass factorization theorem, Gamma function and its properties, Riemann Zeta function, Riemann's functional equation. Runge's theorem .

Unit -I1

Analytic Continuation, Uniqueness of direct analytic continuation, Uniqueness of analytic continuation along a curve, power series method of analytic continuation. Monodromy theorem and its consequences, Harmonic function on a disk, Harnack's inequality and theorem, Dirichlet problem. Green's functions.

Unit -III

Canoncial products, Jensen's formula. Poisson-jensen formula. Hadamard's three circles theorem. Order of an entire function. Exponent of Convergence. Borel's theorem. Hadamard's factorization theorem.

Unit- IV

The range of an analytic function. Bloch's theorem. The little Picard theorem. Schottky's theorem. Montel Caratheodory and the Great Picard theorem. Univalent functions. Bieberbach's conjecture (Statement only) and the "¼ theorem" (Statement only).

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 Publishing House, 1980.
3. L.V. Ahlfors, Complex Analysis, McGraw-Hill, 1979.
4. Mark J. Ablowitz and A.S. Fokas, Complex Variables: Introduction and Applications, Cambridge University Press, South Asian Edition, 1998.
5. S. Ponnusamy, Foundations of Complex Analysis, Narosa Publishing House, 1997.
6. J.W. Brown and R.V. Churchill, Complex variable and Applications, McGraw Hill, 1996.

MAT 614B: ALGEBRAIC CODING THEORY-II

L	T	P		
4	1	- (5 Credits)	Marks for External Exam	: 100
			Marks for External Exam	: 50
			Total	: 150
			Duration of Exam	: 3 Hours

Note: The question paper will consists of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

Unit-I

Cyclic codes. Cyclic Codes as ideals. Description of Cyclic Codes by Matrices and Polynomials . Hamming and Golay Codes as Cyclic Codes. Error Detection with Cyclic Codes. Error-Correctioon procedure for Cyclic Codes. Pseudo Cyclic Codes.

Unit-II

Quadratic residue codes of prime length. Distance Properties . Relationship of these codes with their duals. Extended Quadratic Residue codes (binary case only) . Code Symmetry and Invariance under transitive group of permutations. Hadamard Matrices and non-linear Codes derived from them. Introduction to Product codes and Concatenated codes.

Unit-III

Bose-Chaudhary-Hoquenghem (BCH) Codes. BCH bounds. Reed-Solomon (RS) Codes. Majority-Logic Decodable Codes. Majority- Logic Decoding. Singleton bound. The Griesmer bound.

Unit-IV

Maximum – Distance Separable (MDS) Codes. Generator and Parity-check matrices of MDS Codes. Weight Distribution of MDS Codes. Necessary and Sufficient conditions for a linear code to be an MDS Code. MDS Codes from RS codes. Abramson Codes. Closed-loop burst-error correcting codes (Fire codes). Error Locating Codes.

References

1. Raymond Hill, A First Course in Coding Theory, Oxford University Press, 1986.
2. Man Young Rhee, Erropr Correcting Coding Theory, MC Graw Hill Inc., 1989.
3. W.W. Peterson and E.J. Weldon, Jr., Error-Correcting Codes. M.I.T. Press, Cambridge Massachuetts, 1972.
4. E.R. Berlekamp, Algebraic Coding Theory, MC Graw Hill Inc., 1968.
5. F.J. Macwilliams and N.J.A. Sloane, Theory of Error Correcting Codes, North-Holand Publishing Company.
6. J.H. Van Lint, Introduction to Coding theory, Graduate Texts in Mathematics, 86, Springer, 1998.
7. L.R. Vermani, Elements of Algebraic Coding ,Chapman and Hall,1996.

MAT 616B: MECHANICS OF SOLIDS-II

L	T	P		
5	0	-	(5 Credits)	

Marks for External Exam : 100
Marks for Internal Exam : 50
Total : 150
Duration of Exam : 3 Hours

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

UNIT-I

Two-dimensional Problems: Plane stress, Generalized plane stress, Airy stress function, General Solution of Biharmonic equation, Stresses and displacements in terms of complex potentials, The structure of functions of $\phi(z)$ and $\psi(z)$, First and second boundary value problems in plane elasticity, Thick-walled tube under external and internal pressures.

UNIT-II

Visoelasticiy: Spring & Dashpot, Maxwell and Kelvin Models, three parameter solid, Correspondence principle & its application to the Deformation of a viscoelastic Thick-walled tube in Plane strain.

UNIT-III

Torsion: Torsion of cylindrical bars, Torsional rigidity, Torsion and stress functions, Lines of Shearing stress, Simple problems related to circle, ellipse and equilateral triangle.

Waves: Propagation of waves in an isotropic elastic solid medium, Waves of dilatation and distortion, Plane waves, Elastic surface waves such as Reyleigh and Love waves.

UNIT-IV

Variational methods : Theorem of minimum potential energy, Theorems of minimum complementary energy, Reciprocal theorem of Betti and Rayleigh, Deflection of elastic string, central line of a beam and elastic membrane, Solution of Euler's equation by Ritz, Galerkin and Kantorovich methods.

References

1. I.S. Sokolnikoff, Mathematical Theory of Elasticity, Tata McGraw Hill Publishing Company Ltd., New Delhi,1977.
2. Y.C. Fung, Foundations of Solid Mechanics, Prentice Hall, New Delhi,1965.
3. S. Timoshenko and N. Goodier, Theory of Elasticity, McGraw Hill, New York.
4. W. Flugge, Viscoelasticity, Springer Verlag,1975.

MAT- 618B : OPERATIONS RESEARCH

L	T	P		
4	0	- (4 Credits)	Marks for External Exam	: 100
			Marks for Internal Exam	: 50
			Total	: 150
			Duration of Exam	: 3 Hours

Note: The question paper will consists of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

Unit-I

Linear programming problems:- Problem formulation graphical method, simplex method. For maximization and minixation, penalty method, degenevacy in LPP, other special cases (Infeasible, unbounded & multiple optimum solution), Dual Simplex method & Sensitivity analysis (Vanirtion in price vector, requirement vector & element as of coeff matrin).

Unit-II

Transportation & Assignment Problem:-

Concept of transportation problem, mathematical formulation, various methods of finding initial basic fearible solution, Testing the optimality by MODI method, some special cases of transportation problem, concept of assignment problem, mathematical formulation,l Hungarian method, minimum & maximum cases, unbalanced problem, Traveling salesman problem.

Unit-III

Inventory control:- Introduction to inventory problem, reasons for carring inventory, deterministie models. The classical EOQ (Economic order quantity) model, inventory control models with shortage.

Ouening Theory:-

Introduction, basic quening process, important definitations, various queuing models are (M/M/I): (8 /FcFs), (M/M/I) : (N/FcFs), General erlang queuing model.

Unit-IV

Interger Programming:-

Introduction, importance & solution of I.P.P., Gomory's all I.P. method & Branch & Bound Technique.

Non-Linear Prgramming:-

NLPP, Mathematical formulation and solution with equally constrations, Kuhn-Tucker necessary and sufficient conditions for the optamility of objective function in a GNLP problem.

References

1. Taha, HA.-Operations Research – An introduction -7th edition pearson, 2000
2. Kanti Swarp, Gupta, P.K. and Sing, M.M.-operation Research, Sultan chand & sons, 1985
3. Hiller, F.S. & Libremann, G.J. – Introduction to "OR" 7th Edition Irwin, 2001
4. Mokhtar S. Bazaraa- Linear programming & network flows, 2nd edition, John wiley, 2000
5. J.K. Sharma – Operations Research ; Theory and Applications, Macmilan India, 1997

MAT 620B: ADVANCED FLUID MECHANICS

L	T	P		
5	0	- (5 Credits)	Marks for External Exam	: 100
			Marks for Internal Exam	: 50
			Total	: 150
			Duration of Exam	: 3 Hours

Note: The question paper will consists of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

Unit-I

Stress components in a real fluid, Relations between rectangular components of stress, Connection between stresses and gradients of velocity, Navier-Stock's equations of motion, Exact Solution of Navier-Stoke's equations of motion – Couette flows and generalized Couette flow between two parallel plates, Plane Poiseuille flow, Hagen Poiseuille flow,

Unit -II

Flow through tubes of uniform cross section in form of circle, annulus, ellipse and equilateral triangle under constant pressure gradient, Unsteady flow over a flat plate, Dynamical similarity: Buckingham p-theorem, Reynolds number, Eckert Number, Froude Number, Application of pi-theorem to viscous and compressible fluid.

Unit -III

Boundry Layer Flow: Prandtl's boundary layer, Boundary layer equations in two-dimensions, Blasius solution, Boundary layer thickness, Displacement thickness, Karman integral equations, Separation of boundary layer flow.

Unit -IV

Wave motion in a gas: Speed of Sound, Equation of motion of a gas, Subsonic, Sonic and supersonic flows of a gas, Isentropic gas flows, Flow through a nozzle.

References

1. F. Chorlton, Textbook of Fluid Dynamics, C.B.S. Publisher, Delhi, 1985.
2. H. Schlichting, Boundary Layer Theory, McGraw Hill Book Company, New York, 1979.
3. A. D. Young, Boundary Layers, AIAA Education Series, Washington DC, 1989.
4. S.W. Yuan, Foundations of Fluid Mechanics, Prentice Hall of India Private Limited, New Delhi, 1976.

MAT 622B: ARTIFICIAL INTELLIGENCE

L	T	P		
5	0	-	(5 Credits)	

Marks for External Exam	: 100
Marks for Internal Exam	: 50
Total	: 150
Duration of Exam	: 3 Hours

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

Unit –I

Introduction: Introduction to Artificial Intelligence, Simulation of sophisticated & Intelligent Behavior in different area problem solving in games, natural language, automated reasoning, visual perception, heuristic algorithm versus solution guaranteed algorithms.

Unit –II

Understanding Natural Languages: Parsing techniques, context free and transformational grammars, transition nets, augmented transition nets, Fillmore's grammars, Shanks Conceptual Dependency, grammar free analyzers, sentence generation, and translation.

Unit –III

Knowledge Representation: First order predicate calculus, Horn Clauses, Introduction to PROLOG, Semantic Nets, Partitioned Nets, Minskey frames, Case Grammar Theory, Production Rules Knowledge Base, The Interface System, Forward & Backward Deduction.

Unit –IV

Expert System: Existing Systems (DENDRAL, MYCIN) domain exploration Meta Knowledge, Expertise Transfer, Self Explaining System

References

1. E. Charnick, Introduction to Artificial Intelligence, Addision Wesley
2. E. Rich & K. Knight, Artificial Intelligence, Tata Mc Graw Hill
3. Winston, “LISP”, Addison Wesley

MAT 624 B: COMPUTER GRAPHICS

L	T	P		
5	0	-	(5 Credits)	Marks for External Exam : 100
				Marks for Internal Exam : 50
				Total : 150
				Duration of Exam : 3 Hour

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

Unit –I

Line generation: Points lines, Planes, Pixels and Frame buffers, vector and character generation. Graphics Primitives: Display devices, Primitive devices, Display File Structure, Display control text.

Unit –II

Polygon: Polygon Representation, Entering polygons, Filling polygons.Segments: Segments table, creating deleting and renaming segments, visibility, image transformations.

Unit –III

Transformations: Matrices transformation, transformation routines, displays procedure. Windowing and Clipping: Viewing transformation and clipping, generalize clipping, multiple windowing.Three Dimension: 3-D geometry primitives, transformations, projection clipping.

Unit –IV

Interaction: Hardware input devices handling algorithms, Event handling echoing, Interactive techniques.Hidden Line and Surface: Back face removal algorithms, hidden line methods.Rendering and Illumination: Introduction to curve generation, Bezier, Hermite and B-spline algorithms and their comparisons.

References

1. D.Hearn & M.P.Baker, Computer Graphics, Prentice Hall of India
2. D.F.Rogers, Procedural Elements of Computer Graphics, McGraw Hill
3. Rogar and Adams, Mathematical Elements of Computer Graphics, McGraw Hill.
4. Asthana, Sinha, Computer Graphics, Addison Wesley

MAT 626B: SOFTWARE ENGINEERING

L	T	P		
5	0	-	(5 Credits)	Marks for External Exam : 100 Marks for Internal Exam : 50 Total : 150 Duration of Exam : 3 Hour

Note: The question paper will consist of four sections. Each section will contain two questions and the students shall be asked to attempt five questions in all, selecting at least one question from each section. All questions carry equal marks.

Unit –I

Introduction to Software Engineering: Software Components, Software Characteristics,Software Crisis, Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

Unit –II

Software Design: Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design.

Unit –III

Software Testing: Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom- Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products.

Unit –IV

Software Maintenance: Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re- Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control,

References

1. Bernd Bruegge and Allen H. Dutoit, Object-Oriented Software Engineering Conquering Complex and Changing Systems, Pearson Education Asia
2. Timothy C. Lethbridge and Robert Laganiere, Object-Oriented software Engineering: Practical software development using UML and Java, McGraw Hill Higher education.