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<td>MAL 643</td>
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<td>MAL 644</td>
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Note:-

1. In external major exam there will be nine questions in all taking two questions from each unit and one compulsory question (Question No. 1). The compulsory question will consist of seven short answer type questions, each of two marks and will be distributed over the whole syllabus. The candidate is required to attempt five questions selecting one from each unit and the compulsory question.

2. 30% of the maximum marks in each paper are allocated for internal assessment based on two assignments (handwritten) each of 10 marks and 10 marks in written exam during PCP. (For more details see Prospectus)
M.Sc. (Mathematics) 1ST Semester
MAL- 511 Algebra

Marks for Major Test (External) : 70
Marks for Internal Assessment : 30
Time : 3 Hours
Total :100

Note: The examiner is requested to set nine questions in all taking two questions from each unit and one compulsory question (Question No. 1). The compulsory question will consist of seven short answer type questions, each of two marks and will be distributed over the whole syllabus. The candidate is required to attempt five questions selecting one from each unit and the compulsory question.

Objectives: To familiarize students with some properties of groups and fields which have many applications in Coding Theory.

Unit - I


Unit - II


Unit - III


Unit - IV


Suggested Readings

MAL-512: REAL ANALYSIS

Marks for Major Test (External): 70
Internal Assessment: 30
Total Marks: 100

Time: 3 Hours

Note: The examiner is requested to set nine questions in all taking two questions from each unit and one compulsory question (Question No. 1). The compulsory question will consist of seven short answer type questions, each of two marks and will be distributed over the whole syllabus. The candidate is required to attempt five questions selecting one from each unit and the compulsory question.

Objectives: To acquaint the students with the topics of Riemann-Stieltjes integral, sequence and series of functions, power series, functions of several variables and with the basic concepts of measurability of sets.

Unit – I

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 - II

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, Weierstrass approximation theorem, Power series, uniqueness theorem for power series, Abel's theorems.

Unit - III

Functions of several variables, linear transformations, derivatives in an open subset of $\mathbb{R}^n$, chain rule, partial derivatives, interchange of the order of differentiation, derivatives of higher orders, Taylor's theorem, Inverse function theorem, Implicit function theorem, Jacobians, extremum problems with constraints, Lagrange's multiplier method.

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, $F_\sigma$ and $G_\delta$ sets, non measurable sets.

Suggested Readings

Note: The examiner is requested to set nine questions in all taking two questions from each unit and one compulsory question (Question No. 1). The compulsory question will consist of seven short answer type questions, each of two marks and will be distributed over the whole syllabus. The candidate is required to attempt five questions selecting one from each unit and the compulsory question.

Objectives: To familiarize students with the basic concepts of moment of inertia; representation of the equations of motion for mechanical systems using the Lagrangian and Hamiltonian formulations of classical mechanics.

Unit - I


Unit - II


Unit - III


Unit - IV


Suggested Readings
MAL-514: ORDINARY DIFFERENTIAL EQUATIONS-I

Marks for Major Test (External): 70
Internal Assessment: 30
Total Marks: 100

Time: 3 Hours

Note: The examiner is requested to set nine questions in all taking two questions from each unit and one compulsory question (Question No. 1). The compulsory question will consist of seven short answer type questions, each of two marks and will be distributed over the whole syllabus. The candidate is required to attempt five questions selecting one from each unit and the compulsory question.

Objectives: To acquaint the students with existence and uniqueness of solutions of initial value problems, continuation of solutions, differential inequalities and with Sturm-Liouville boundary value problems.

Unit - I

Unit - II

Unit - III
Total differential equations: Condition of integrability, Methods of Solution. Gronwall's differential inequality, Comparison theorems involving differential inequalities.

Unit – IV
Zeros of solutions, Sturms separation and comparison theorems. Oscillatory and nonoscillatory equations, Riccati's equation and its solution, Prüfer transformation, Lagrange's identity and Green's formula for second-order equation, Sturm-Liouville boundary-value problems, properties of eigen values and eigen functions. (Relevant topics from the books by Birkhoff & Rota, and by Ross).

Suggested Readings

Note: The examiner is requested to set nine questions in all taking two questions from each unit and one compulsory question (Question No. 1). The compulsory question will consist of seven short answer type questions, each of two marks and will be distributed over the whole syllabus. The candidate is required to attempt five questions selecting one from each unit and the compulsory question.

Objectives: To familiarize with the analytic and meromorphic functions and their applications.

Unit - I

Cauchy Riemann Equations, Analytic functions, Reflection principle, Complex Integration, Antiderivatives, Cauchy-Goursat Theorem, Simply and Multiply connected domains, Cauchy's Integral formula, Higher Order derivatives,

Unit - II


Unit - III


Unit - IV

Branches of many valued functions with special reference to arg z, Log z, z^n. Bilinear transformations, their properties and classification, definition and examples of conformal mapping.

Suggested Readings

MAL-516: PROGRAMMING WITH FORTRAN (THEORY)

Marks for Major Test (External): 70
Internal Assessment: 30
Total Marks: 100

Time: 3 Hours

Note: The examiner is requested to set nine questions in all taking two questions from each unit and one compulsory question (Question No. 1). The compulsory question will consist of seven short answer type questions, each of two marks and will be distributed over the whole syllabus. The candidate is required to attempt five questions selecting one from each unit and the compulsory question.

Objectives: To familiarize the students with the basics of computer and programming concepts of scientific language Fortran 90/95.

Unit - I


Unit - II

Programming in Fortran 90/95: Numerical constants and variables, arithmetic expressions; implicit declaration, named constants, input/output; List directed input/output statements, Format specifications

Unit - III

Logical expressions and control flow; conditional flow; IF structure, Block DO loop Counted controlled Loops, arrays; strings; array arguments.

Unit - IV

Functions; subroutines; Derived types Processing files, Sequential file, Direct Access file; Pointers.

Suggest Readings

2. J.F. Kerrigan : Migrating to FORTRAN 90, Orielly Associates, CA, USA.
3. M. Metcalf and J. Reid : FORTRAN 90/95 Explained, OUP, oxford, UK.
Note: The examiner is requested to set nine questions in all taking two questions from each unit and one compulsory question (Question No. 1). The compulsory question will consist of seven short answer type questions, each of two marks and will be distributed over the whole syllabus. The candidate is required to attempt five questions selecting one from each unit and the compulsory question.

Objectives: To familiarize students with some properties of rings and modules.

Unit - I


Unit - II


Unit - III


Unit - IV


Suggested Readings

MAL-522: MEASURE AND INTEGRATION THEORY

Marks for Major Test (External): 70
Internal Assessment: 30
Total Marks: 100

Time: 3 Hours

Note: The examiner is requested to set nine questions in all taking two questions from each unit and one compulsory question (Question No. 1). The compulsory question will consist of seven short answer type questions, each of two marks and will be distributed over the whole syllabus. The candidate is required to attempt five questions selecting one from each unit and the compulsory question.

Objectives: To acquaint the students with the topics of measurable functions, Lebesgue integral, Differentiation of monotonic functions and $L^p$ spaces.

Unit - I


Unit - II


Unit - III

Vitali's covering Lemma, Differentiation of monotonic functions, 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.

Unit - IV


Suggested Readings
2. P.K.Jain and V.P.Gupta, Lebesgue Measure and Integration, New Age International (P) Limited Published, New Delhi, 1986 (Reprint 2000).
MAL-523: METHODS OF APPLIED MATHEMATICS

Marks for Major Test (External): 70
Internal Assessment: 30
Total Marks: 100

Time: 3 Hours

Note: The examiner is requested to set nine questions in all taking two questions from each unit and one compulsory question (Question No. 1). The compulsory question will consist of seven short answer type questions, each of two marks and will be distributed over the whole syllabus. The candidate is required to attempt five questions selecting one from each unit and the compulsory question.

Objectives: To familiarize the students with basics of Fourier Transforms and its applications, Curvilinear Co-ordinates, probability distributions, multiple correlation and sampling distributions.

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, Change of Co-ordinates, Cartesian, Cylindrical and spherical co-ordinates, expressions for velocity and accelerations, ds, dv and ds^2 in orthogonal co-ordinates, Areas, Volumes & 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, Metric coefficients & the volume element.

Unit - III

Sample spaces, random variables, Mathematical expectation and moments, Binomial, Poisson, Geometric, Uniform and Exponential distributions.

Unit - IV

Normal & Gamma distributions. Multiple Regression, Partial and Multiple Correlation, t, F and Chi-square distributions, weak law of large numbers and Central Limit Theorem.

Suggested Readings

2. Schaum's Series, Vector Analysis.
MAL-524: ORDINARY DIFFERENTIAL EQUATIONS-II

Marks for Major Test (External): 70
Internal Assessment: 30
Total Marks: 100

Time: 3 Hours

Note: The examiner is requested to set nine questions in all taking two questions from each unit and one compulsory question (Question No. 1). The compulsory question will consist of seven short answer type questions, each of two marks and will be distributed over the whole syllabus. The candidate is required to attempt five questions selecting one from each unit and the compulsory question.

Objectives: To familiarize the students with linear systems, adjoint systems, non-linear systems and with some motivating problems of calculus of variation.

Unit - I

Linear systems, fundamental set and fundamental matrix of a homogeneous system, Wronskian of a system. Abel - Liouville formula, Adjoint systems, Reduction of the order of a homogeneous system.

Unit - II

Systems with constant coefficients, Method of variation of constants for a non-homogeneous system, Periodic solutions, Floquet theory for periodic systems, Linear differential equations of order n, Lagrange’s identity, Green’s formula (Relevant topics from the book by Coddington and Levinson and by S.L.Ross).

Unit – III

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, 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

Motivating problems of calculus of variations, Shortest distance, Minimum surface of revolution, Brachistochrone problem, Isoperimetric problem, Geodesic, Fundamental lemma of calculus of variations, Euler's equation for one dependent function and its generalization to 'n' dependent functions and to higher order derivatives, Conditional extremum under geometric constraints and under integral constraints. (Relevant topics from the book by Gelfand and Fomin)

Suggested Readings

Note: The examiner is requested to set nine questions in all taking two questions from each unit and one compulsory question (Question No. 1). The compulsory question will consist of seven short answer type questions, each of two marks and will be distributed over the whole syllabus. The candidate is required to attempt five questions selecting one from each unit and the compulsory question.

Objectives: To familiarize the concepts of analytic continuation, properties of entire functions and conformal mapping.

Unit - I

Analytic Continuation; Spaces of Analytic functions, Hurwitz's theorem, Montel's theorem, Uniqueness of direct analytic continuation, Uniqueness of analytic continuation along a curve, power series method of analytic continuation. Monodromy theorem and its consequences.

Unit – II

Entire function; Canonical products, Weierstrass’ factorisation theorem, Exponent of Convergence, Order of an entire function, Jensen's formula, Borel's theorem. Hadamard's factorization theorem, Hadamard's three circles theorem.

Unit – III


Unit - IV

Conformal mapping; Riemann mapping theorem, Harmonic function on a disk, Dirichlet problem. Green's function. Harnack's inequality and theorem, Univalent functions. Bieberbach's conjecture (Statement only) and the 1/4 theorem.


Suggested Readings

MAL-526: Advanced Numerical Methods

Marks for Major Test (Theory) : 70
Marks (Internal Assessment) : 30
Total Marks: 100

Time : 3 ours
Note: Attempt five questions in all. The question paper will consist of four sections. Question No. 1 will contain seven short answer type questions without any internal choice covering the entire syllabus and shall be compulsory. Each of the four sections (I-IV) will contain two questions and the students are required to attempt one question from each section. All questions carry equal marks.

Unit-I
Interpolation and Approximation
Interpolation: Introduction of Gauss’ Central Difference Formulae, Stirling’s Formula, Bessel’s Formula without proof, Everett’s Formula, Relation between Bessel’s and Everett’s Formulae. Hermite’s Interpolation Formula, Divided Differences and Their Properties, Newton’s General Interpolation Formula, Interpolation by Iteration, Inverse Interpolation, Double Interpolation.
Approximation: Norms of functions – Best Approximations: Least squares polynomial approximation–Approximation with Chebyshev polynomials – Piecewise Linear & Cubic Spline approximation.

Unit-II
Numerical Differentiation and Integration

Unit-III
Iterative Methods for Linear and Nonlinear System

Unit-IV
Numerical solution of ordinary differential equations
Initial value problems: Runge Kutta methods of fourth order, Multistep method- The Adams-Moulton method, stability, Convergence and Truncation error for the above methods. Milne’s method, Cubic spline method, Simultaneous and higher order equations,
Boundary Value Problems: Second order finite difference, Shooting method and Cubic spline methods, Numerov's method, Mixed BVPs.

Suggested Readings:
Note: The examiner is requested to set nine questions in all taking two questions from each unit and one compulsory question (Question No. 1). The compulsory question will consist of seven short answer type questions, each of two marks and will be distributed over the whole syllabus. The candidate is required to attempt five questions selecting one from each unit and the compulsory question.

Objectives: To familiarize the students with basics of a topological space, compactness, connectedness, separation axioms and product spaces..

Unit - I


Unit - II


Unit - III


Unit - IV


Suggested Readings

5. J. Dugundji, Topology, Allyn and Bacon, 1966 (Reprinted in India by Prentice Hall of India Pvt. Ltd.).
MAL-632: PARTIAL DIFFERENTIAL EQUATIONS

Marks for Major Test (External): 70
Internal Assessment: 30
Total Marks: 100

Time: 3 Hours

Note: The examiner is requested to set nine questions in all taking two questions from each unit and one compulsory question (Question No. 1). The compulsory question will consist of seven short answer type questions, each of two marks and will be distributed over the whole syllabus. The candidate is required to attempt five questions selecting one from each unit and the compulsory question.

Objectives: To familiarize the students with linear and non-linear partial differential equations in $\mathbb{R}^n$ and various methods to obtain the solution of partial differential equations.

Unit - I


Unit – II


Unit – III

Heat Equation-Fundamental Solution, Solution of initial value problem, Non Homogeneous Equation, Mean Value Formula.


Unit – IV


Suggested Readings

MAL-633: MECHANICS OF SOLIDS-I

Time: 3 Hours

Marks for Major Test (External): 70
Internal Assessment: 30
Total Marks: 100

Note: The examiner is requested to set nine questions in all taking two questions from each unit and one compulsory question (Question No. 1). The compulsory question will consist of seven short answer type questions, each of two marks and will be distributed over the whole syllabus. The candidate is required to attempt five questions selecting one from each unit and the compulsory question.

Objectives: To familiarize students with basics of Cartesian Tensor, theory of elasticity including strain/displacement relations, equilibrium and constitutive equations, Hooke’s law to develop stress-strain relationships for different types of materials, basic properties of materials to solve problems related to isotropic elasticity.

Unit - I
Cartesian Tensor: Coordinate transformation, Cartesian Tensor of different order, Sum or difference and product of two tensors. Contraction theorem, Quotient law, Symmetric & Skew symmetric 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

Unit - III

Unit - IV

Suggested Readings
MAL-636: FLUID MECHANICS

Marks for Major Test (External): 70
Internal Assessment: 30
Total Marks: 100

Time: 3 Hours

Note: The examiner is requested to set nine questions in all taking two questions from each unit and one compulsory question (Question No. 1). The compulsory question will consist of seven short answer type questions, each of two marks and will be distributed over the whole syllabus. The candidate is required to attempt five questions selecting one from each unit and the compulsory question.

Objectives: The objective of this paper is to make the students familiar with the flow properties of ideal fluid.

Unit - I

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

Unit - II

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

Stream functions, Stokes stream functions, Sources, Sinks and doublets, Images in a rigid impermeable infinite plane and in impermeable spherical surfaces Conformal mapping, Milne-Thomson Circle theorem, Blasius theorem.

Unit - IV

Two-dimensional irrotational motion produced by motion of circular, co-axial and elliptic cylinders in an infinite mass of liquid, Vortex motion and its elementary properties, Kelvin's proof of permanence, motion due to rectilinear vortices.

Suggested Readings

MAL-637: ADVANCED DISCRETE MATHEMATICS

Marks for Major Test (External): 70
Internal Assessment: 30
Total Marks: 100

Time: 3 Hours

Note: The examiner is requested to set nine questions in all taking two questions from each unit and one compulsory question (Question No. 1). The compulsory question will consist of seven short answer type questions, each of two marks and will be distributed over the whole syllabus. The candidate is required to attempt five questions selecting one from each unit and the compulsory question.

Objectives: To study some important results of discrete mathematics with their applications.

Unit - I

Formal Logic - Statements, Symbolic, Representation and Tautologies, Quantifiers, Proposition Logic. Lattices - Lattices as partially ordered sets, Their properties, Lattices as Algebraic systems, Some special Lattices, e.g., complete, complemented and Distributive Lattices. Sets Some Special Lattices e.g., Bounded, Complemented & Distributive Lattices.

Unit - II

Boolean Algebra - Boolean Algebra as Lattices, Various Boolean Identities, The Switching Algebra example, Join - irreducible elements, Atoms and Minterms, Boolean Forms and Their Equivalence, Minterm Boolean Forms, Sum of Products canonical Forms, Minimization of Boolean Functions, Applications of Boolean Algebra to Switching Theory (using AND, OR and NOT gates).

Unit - III

Graph Theory - Definition of Graphs, Paths, Circuits, Cycles and Subgraphs, Induced Subgraphs, Degree of a vertex, Connectivity, Planar Graphs and their properties, Euler's Formula for Connected Planar Graph, Complete and Complete Bipartite Graphs,

Unit - IV


Suggested Readings

4. N.Deo, Graph Theory with Applications to Engineering and Computer Sciences, Prentice Hall of India.
MAP634: COMPUTING LAB-2
1.5 Credits (0-0-3)

Marks for Major Test (External): 70
Internal Assessment: 30
Total Marks: 100

Objectives: The objective of the course is to familiarize the students with the working of the MATLAB softwares:

Introduction of Starting MATLAB, Creating Arrays, Mathematical operations with Arrays, creating M. files, script-files and functions and files and managing data, Two-dimensional plots, Programming in MATLAB, User-defined functions and function files, Polynomials, Applications in numerical analysis, Symbolic Math.

Suggested Readings

M.Sc. (Mathematics) 4TH Semester
MAL641: FUNCTIONAL ANALYSIS

Marks for Major Test (External): 70
Internal Assessment: 30
Total Marks: 100

Time: 3 Hours

Note: The examiner is requested to set nine questions in all taking two questions from each unit and one compulsory question (Question No. 1). The compulsory question will consist of seven short answer type questions, each of two marks and will be distributed over the whole syllabus. The candidate is required to attempt five questions selecting one from each unit and the compulsory question.

Objective: To familiarize the students with the topics of Normed linear spaces, Conjugate spaces, Equivalent norms and Inner product spaces.

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 \( l_p \), \( L_p \), \( \mathbb{R}^n \), \( \mathbb{C}^n \) and \( C[a, b] \). Bounded linear transformation. Equivalent formulation of continuity. Spaces of bounded linear transformation. Continuous linear functional, conjugate spaces.

Unit - II
Hahn Banach extension theorem (Real and Complex form), Riesz Representation theorem for bounded linear functionals on \( L^p \) and \( C[a, b] \). Second Conjugate spaces, Reflexive spaces, uniform boundedness principle and its consequence, open mapping theorem and its application, projections, closed graph theorem.

Unit - III
Equivalent norms, weak and strong convergence, their equivalence in finite dimensional spaces. 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.

Unit - IV

Suggested Readings

MAL-642: DIFFERENTIAL GEOMETRY

Time: 3 Hours

Note: The examiner is requested to set nine questions in all taking two questions from each unit and one compulsory question (Question No. 1). The compulsory question will consist of seven short answer type questions, each of two marks and will be distributed over the whole syllabus. The candidate is required to attempt five questions selecting one from each unit and the compulsory question.

Objectives: To apply the concepts and techniques of differential geometry of curves and surfaces; understand the curvature and torsion of a space curve and how to analyze and solve problems, First and Second fundamental forms of a surface; compute the mean and Gauss curvature of a surface; find geodesics on a given surface and its torsion.

Unit - I

Curves with torsion: Tangent, Principal Normal, Curvature, Binormal, Torsion, Serret Frenet formulae (Relevant sections of Weatherburn's book).

Unit - II

Locus of centre of Curvature, Locus of centre of Spherical Curvature, Surfaces, Tangent plane, Normal, Envelope, Characteristics, Edge of regression (Relevant sections of Weatherburn's book).

Unit - III

Curvilinear Co-ordinates, First order magnitudes, Directions on a surface, The Normal, Second order magnitudes, Derivative of unit normal (Relevant sections of Weatherburn's book).

Unit - IV

Principal directions and curvatures, First and Second curvatures, Geodesic property, Equations of geodesics, Surface of revolution, Torsion of a geodesic (Relevant sections of Weatherburn's book).

Suggested Readings

1. C.E., Weatherburn, Differential Geometry of Three Dimensions
2. M. Lipschultz, Differential Geometry, Schaum Outlines
MAL-643: MECHANICS OF SOLIDS-II

Marks for Major Test (External): 70
Internal Assessment: 30
Total Marks: 100

Time: 3 Hours

Note: The examiner is requested to set nine questions in all taking two questions from each unit and one compulsory question (Question No. 1). The compulsory question will consist of seven short answer type questions, each of two marks and will be distributed over the whole syllabus. The candidate is required to attempt five questions selecting one from each unit and the compulsory question.

Objectives: To familiarize the students with Two-dimensional elastostastic, problems, fundamentals of Viscoelasticity, Torsion of cylindrical bars, propagation of waves in an elastic solids and variational methods used in deformation of elastic materials.

Unit - I


Unit - II

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

Unit - III


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

Unit - IV


Suggested Readings

MAL-644: INTEGRAL EQUATIONS

Marks for Major Test (External): 70
Internal Assessment: 30
Total Marks: 100

Time: 3 Hours

Note: The examiner is requested to set nine questions in all taking two questions from each unit and one compulsory question (Question No. 1). The compulsory question will consist of seven short answer type questions, each of two marks and will be distributed over the whole syllabus. The candidate is required to attempt five questions selecting one from each unit and the compulsory question.

Objectives: To familiarize the students with the concepts of integral equations and various methods for the solutions of different type of integral equations.

Unit – I


Unit - II


Unit - III


Unit - IV

Singular Integral Equations - Inversion formula for singular integral equation with kernel of type (h(s) - h(t) - a, 0< a <1). Dirac Delta Function. Green's function approach to reduce boundary value problems of a self-adjoint differential equation with homogeneous boundary conditions to integral equation forms. Auxiliary problem satisfied by Green's function. Modified Green's function.

Suggested Readings

4. Hildebrand. F.B - Methods of Applied Mathematics
MAL-645: ADVANCED FLUID MECHANICS

Marks for Major Test (External): 70
Internal Assessment: 30
Total Marks: 100

Time: 3 Hours

Note: The examiner is requested to set nine questions in all taking two questions from each unit and one compulsory question (Question No. 1). The compulsory question will consist of seven short answer type questions, each of two marks and will be distributed over the whole syllabus. The candidate is required to attempt five questions selecting one from each unit and the compulsory question.

Objectives: The objectives of this paper is to make familiar with the flow properties of real fluids and their applications in science and technology.

Unit – I

Stress components in a real fluid, Relations between rectangular components of stress, Connection between stresses and gradients of velocity. Viscous fluid, Navier-Stoke'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 the form of circle, annulus, ellipse and equilateral triangle under constant pressure gradient. Unsteady flow over a flat plate. Dynamical similarity: Buckingham $\pi$-theorem. Reynolds number, Wever Number, Mach Number, Froude Number, Eckert Number, Application of pi- theorem to viscous and compressible fluid flow.

Unit – III

Boundry Layer Flow: Prandtl's boundary layer approximation, boundary layer thickness, displacement thickness, momentum thickness; boundary layer equations in two-dimensions, Blasius solution, Karman integral equations. Separation of boundary layer.

Unit – IV


Suggested Readings

MAL-648: COMPUTING LAB-III

Marks for Major Test (External): 70
Internal Assessment: 30
Total Marks: 100

Time: 3 Hours

Objectives: The objective of the course is to familiarize the students with the working of the LATEX software:


Suggested Readings

1. Harvey J. Greenberg, A Simplified Introduction to Latex.