NIZAM COLLEGE(AUTONOMOUS)::OSMANIA UNIVERSITY
DEPARTMENT OF MATHEMATICS
B.SC.IST YEAR – I -SEMSTER
PAPER-I -DIFFERENTIAL EQUATIONS

UNIT I:

Differential Equations of First Order and First Degree: Linear differential equations; Differential equations reducible to linear form; Exact differential equations; Integrating factors; Change of variables, Orthogonal trajectories.

UNIT-II:

Differential Equations of the First Order but not of the First Degree:

Equations solvable for p, x, y, equations that do not contain x or y, Clairaut's Equation, singular solutions. Solutions of Homogeneous linear differential equations of order n with constant coefficients.

UNIT-III:

Non-Homogeneous linear differential equations with constant coefficients

Solutions of the Non-homogeneous linear differential equations with constant coefficients by means of Polynomial operators. Method of Undetermined Coefficients.

UNIT-IV:

Linear Differential equations with non constant coefficients : Solutions of Linear Differential Equations with variable Coefficients, Method of Variation of parameters. The Cauchy- Euler Equations.

System of Linear Differential Equations:

Solutions of a System of Linear equations with constant coefficients, An equivalent triangular system, Degenerate case: $P_1(D)P_4(D) - P_2(D)P_3(D) = 0$

Prescribed Text Book:

Scope and Treatment as in Differential Equations and their Applications" By : Zafar Ashan published by Prentice Hall of India Pvt. Ltd. New Delhi-Second edition:
Sections:- 2.5 to 2.9,3.1,3.2,4.20,5.2 to 5.7,7.3,7.4.

Reference:

1. "Ordinary and Partial Differential Equations" By: M.D.Raisingania (Part-I).
2. Telugu Academy Differential Equations.

NIZAM COLLEGE(AUTONOMOUS)::OSMANIA UNIVERSITY
DEPARTMENT OF MATHEMATICS
B.SC.I8T YEAR – II -SEMSTER
PAPER-II -SOLID GEOMETRY

UNIT-I:
THE PLANE
Equation of Plane in terms of its intercepts on the axis, through the Given points, Length of the perpendicular from a given point to a given plane, Bisectors of angles between two Planes, Combined Equation of Two Planes, orthogonal projection on a plane.

UNIT-II:
THE LINE:
Equations of a Line, angle between a line and a Plane, the Condition that a Given line may lie in a given plane, the condition that two given lines are coplanar, Number of arbitrary constants in the Equations of a Straight Line. Sets of Conditions which determine a line, the Shortest distance between two lines. The length and Equations of the line of Shortest distance between two straight lines, Length of the perpendicular from a given point to a given point to a given line, Intersection of three planes, Triangular Prism.

UNIT-III:
THE SPHERE:
Definition and equation of the Sphere, Equation of the sphere through four given points, Plane section of the sphere, Intersection of Two Spheres; Equation of a circle. Sphere through a given circle; Intersection of a sphere and a line. Power of a point; Tangent Plane; Plane of Contact. Polar Plane, Conjugate points, Conjugate planes; Angle of intersection of Two Spheres. Conditions for two spheres to be orthogonal; Radical Plane, Coaxial System of Spheres; Simplified form of the equation of Two Spheres.

UNIT-IV:
CONES, CYLINDERS AND CONICOIDS:
Definitions of a Cone, Guiding Curve, generators Enveloping cone of a Sphere. Equations of Cone with vertex at origin are homogeneous. Condition that the general equation of the Second degree should represent a Cone. Condition that a cone may have three mutually perpendicular generators. Intersection of a line and a quadratic Cone. Tangent Lines and Tangent Plane at a point. Condition that a plane may touch a Cone. Reciprocal Cones, Right Circular Cone. Cylinder, Enveloping Cylinder of a Sphere. The right circular Cylinder. Equation of the right circular Cylinder with a given axis and radius.The general equation of the second degree and the various surfaces represented by it; Shapes of some surfaces. Nature of Ellipsoid. Nature of hyperboloid of one sheet.

Prescribed Text Book:
"Analytical Solid Geometry" By Shanti Narayan and P.K.Mittal, published by S.Chand and Company Ltd. Seventh edition:
Reference Book:
1. P.K. Jain and Khaleel Ahmed, " A Text Book of Analytical Geometry of Three Dimensions", Wiley Eastern Ltd.,1999.
2. Telugu Academy Book on Solid Geometry.

NIZAM COLLEGE(AUTONOMOUS)::OSMANIA UNIVERSITY
DEPARTMENT OF MATHEMATICS
B.SC.IInd YEAR – III -SEMSTER
PAPER-III -ABSTRACT ALGEBRA

Title: ABSRACT ALGEBRA

UNIT-I

Elements of Number Theory: The Division algorithm , Divisibility, Primes, G.C.D, L.C.M, Linear Congruence's, Solutions of Congruence's, The Function $\phi(n)$, Fermat's Theorem, Wilson's Theorem.

(Scope as in An Introduction to the Theory of Numbers by Ivan Niven,Herbert S. Zuckerman, published by Wiley Eastern Limited)

UNIT-II:

Binary Operations: Definition and Properties, Tables

Groups: Definition and Elementary Properties, Finite Groups and Group Tables .**Subgroups:** Subsets and Subgroups, Cyclic Subgroups.

UNIT-III

Groups of Cosets: Cosets, Applications

Normal Subgroups and Factor Groups: Factor groups Criteria for the Existence of a Cosets in Group, Inner Automorphisms and Normal subgroups, Factor Groups, Simple groups, cyclic group and its properties.

UNIT-IV:

Homorphisms: Definition and Elementary Properties, The Fundamental homomorphism theorem, Applications.

Isomorphism: Definition and elementary properties , how to show that groups are isomorphic , how to show that group are not isomorphic, Cayley's Theorem.

Permutations: Functions and Permutations, Group of Permutations, Cycles and Cyclic notation, even and odd permutations, The Alternatig groups.

Prescribed text book:

Scope and treatment as in "The First Course in Abstract Algebra" (3^{rd} edition) by John B Fraleigh, Narosa Publishing house,

Reference Books:

1. Topics in Algebra, I.N. Herstein, Wiley Eastern.
2. Contemporary Abstract algebra by Joseph A Gallian, Narosa Publishing House.
3. Telugu Academy Text Book on Abstract Algebra.

NIZAM COLLEGE(AUTONOMOUS)::OSMANIA UNIVERSITY
DEPARTMENT OF MATHEMATICS
B.SC.IInd YEAR – IV -SEMSTER
PAPER-IV -REAL ANALYSIS

UNIT –I:

THE REAL NUMBERS:
The Algebraic and Order properties of **R.** Absolute Value and Real Line. The Completeness Property of R, Applications of the Supremum Property, Intervals.
(No question should be set from this part)

SEQUENCES
Sequences and their Limits, Limit Theorems Monotone Sequences, Subsequences and the Bolzano–Weierstrass theorem, The Cauchy Criterion, Properly Divergent Sequences, Cauchy's first and second theorem.

SERIES
Introduction to series, Absolute convergence, test for absolute convergence, test for non-absolute convergence.

UNIT-II
CONTINUOUS FUNCTIONS.
Continuous Functions , Combination of Continuous Functions, Continuous Functions on Intervals, Uniform Continuity: Definition , Non Uniform Continuity criteria, Uniform Continuity theorem.

UNIT-III:
DIFFERENTIATION :

The Derivative, The Mean Value Theorems, L'Hospital Rules, Taylor's theorem.

UNIT-IV:

RIEMANN INTEGRATION:

The Riemann Integral: The Riemann Integral , Riemann Integrable Functions, The Fundamental Theorem of integral Calculus.

Prescribed text Book:
Scope as in " Introduction to Real Analysis "- By Robert G Bartle and Donald R. Sherbert, John Wiley, 3rd edition. Chapter 3, (3.1 to 3.7), Chapter 5 (5.1 to 5.4), Chapter6 (6.1 to 6.4), Chapter7(7.1 to 7.3), Chapter 9(9.1,9.2 and 9.3).

Reference Books:
1. A course of Mathematical Analysis, Shanthi Narayan and P.K.Mittal.
2. Mathematical analysis by S.C.Malik and Arora, Wiley Eastern Ltd.
3. Telugu Academy Text Book.

NIZAM COLLEGE(AUTONOMOUS)::OSMANIA UNIVERSITY
DEPARTMENT OF MATHEMATICS
B.SC.IIIrd YEAR – V -SEMSTER
PAPER-V- RINGS, MULTIPLE INTEGRALS, VECTOR CALCULUS

UNIT-I:

Definitions and basics properties, Fields, Integral domains, divisors of zero and Cancellation laws, Integral domains, the characteristic of a ring, some non-commutative rings, Examples, Matrices over a field, The real quaternion Ring.

UNIT-II:

Homomorphism of Rings- Definition and elementary properties, Maximal and Prime ideals, Prime fields. Rings of Polynomials in an indeterminate form, The evaluation of homomorphism.

UNIT-III

Concept of a Plane, Curve, Line Integral, The Area of a subset R^2, Calculation of Double Integrals, Jordan Curve, Area, Change of the Order of Integration, Double Integral as a Limit, Change of a variable in a Double Integration. Lengths of Curves, Surface Areas, Integral expression for the lengths of a Curve Surfaces, Surface Areas.

UNIT-IV

Vector Differentiation, Ordinary Derivatives of Vectors, Space Curves, Continuity, Differentiability, Gradient, Divergence, Curl operators, Formulae involving this operators, Vector Integration, theorems of Guass , Stokes and Green's theorem in plane and applications of this theorems.

Prescribed Book:

1."The First Course in Abstract Algebra" (3^{rd} edition) by John B Fraleigh.
2. A Course of Mathematical Analysis, By Shanthi Narayan and PK Mittal.
3. Vector Analysis, By Murray R Speigel

Reference:

1. Abstract Algebra by I.N.Heirstien,
2. Mathematical Analysis, By S.C.Malik and Savitha Arora.
3. Telugu Academy Text Book.

NIZAM COLLEGE(AUTONOMOUS)::OSMANIA UNIVERSITY
DEPARTMENT OF MATHEMATICS
B.SC.IIIrd YEAR – VI -SEMSTER
PAPER-VII -LINEAR ALGEBRA

UNIT-I

Vector spaces, subspaces, Linear Combinations, Linear Span, Linear Dependence, Linear Independence, Basis and Dimension, Dimension of Subspace.

UNIT-II

Linear Transformation/ Operators, Null spaces and Ranges Rank-Nullity theorem, Composition of Linear Transformations, Invertibility , Isomorphism and , The matrix representation of linear transformation.

UNIT-III.

System of Linear Equations, Matrix Operations a Elementary Matrices, The rank of a Matrix , Eigen values and Eigen vectors, Sylvestor's law of Nullity, Diagonalizability, Cayley Hamilton theorem.

UNIT-IV

Inner products, Euclidian and Unitary Spaces, Norm or Length of a Vector, Schwartz Inequality, Orthogonality, Orthonormal Set, Complete orthonormal set, The Gram-Schmidt Orthogonaliztion Process.

Prescribed:

Linear Algebra by J.N.Sharma and A.R.Vasista.

Reference:

1. Linear Algebra By Hoffman and Kunze.
2. Linear Algebra By Stephen H. Friedberg.
3. Telugu Academy Text Book.

NIZAM COLLEGE(AUTONOMOUS)::OSMANIA UNIVERSITY
DEPARTMENT OF MATHEMATICS
B.SC.IIIrd YEAR – V -SEMSTER
PAPER-VI(B) - INTEGRAL TRANSFORMS (LAPLACE TRANSFORM)

UNIT-I

Definition of Laplace Transform, Linearity property, piecewise continuous functions, Existence of Laplace Transforms, Functions of Exponential order and of Class A, First and Second Shifting theorems of Laplace Transform, Change of scale property, Multiplication by 't' , division by 't'.

UNIT-II

Laplace transform of derivatives, final and initial value theorems, Laplace transform of Integrals, Laplace transform of periodic functions and error function, Beta function and Gamma functions,

UNIT-III

Definition of inverse Laplace transform, linearity property, first and second shifting theorems of inverse Laplace transform, Change of scale property, division by 'p', Convolution theorem, Heavisides expansion formula(with profs and applications).

UNIT-IV

Solution of Ordinary differential Equations with constant coefficients, variable coefficients solution of simultaneous Ordinary Differential Equations, Solutions of partial Differential Equations, boundary Value problems, Heat Equation, Wave Equation, Laplace Equation and Integral Equations.

Text Book: **"**Integral Transforms" : By Vasista and Gupta

Reference Book: "Integral Transforms" Schaum's Outline Series " By Tata-Mc-Grahill.

NIZAM COLLEGE(AUTONOMOUS)::OSMANIA UNIVERSITY
DEPARTMENT OF MATHEMATICS
B.SC.IIIrd YEAR – VI -SEMSTER
PAPER-VIII(B) - INTEGRAL TRANSFORMS (FOURIER TRANSFORMS)

UNIT-I

Periodic Function, Fourier series, Expansion of periodic functions with period **"2l"** in the intervals $(-l, l)$, $(-\pi, \pi)$, $\left(\frac{-\pi}{2}, \frac{3\pi}{2}\right)$ and $(0, 2\pi)$. Half range sine and cosine series in the interval $(0, l)$ and $(0, \pi)$.

UNIT-II

Dirichlet's conditions, Fourier integral formulae (without Proof) , Fourier Transform, Inverse theorem for Fourier transform, Linearity property of Fourier transforms, Change of Scale property, shifting theorem, modulation theorem, convolution theorem of Fourier Transforms, parseval's identity,

UNIT-III

Fourier Sine and Cosine transforms and their inversion formulae, Finite Fourier sine Transform, Inversion formulae for finite Sine and Cosine Transform.

UNIT-IV

Applications of Fourier Transform, Fourier Sine and Cosine Transforms, Fourier finite Sine and Cosine Transforms to Initial and Boundary Value problems.

Text Book:

1. Integral Transforms : By Vasista and Gupta.
2. Fourier Series and Boundary Value Problems : By Ruel V. Churchill.

Reference:

1. Integral Transforms " Schaum's Outline Series ", By Tata-Mc-Grahill.
2. Advanced Engineering Mathematics : By Ervin Kreyszig .

NIZAM COLLEGE(AUTONOMOUS)::OSMANIA UNIVERSITY
DEPARTMENT OF MATHEMATICS
B.SC.IIIrd YEAR – V -SEMSTER
PAPER-VI(A) - NUMERICAL ANALYSIS

UNIT-I

Numbers and their accuracy, Errors and their Computation, Absolute, Relative and Percentage, General error Formulae, Error in a series approximation, Solution of Algebraic and Transcendental Equations by Bi-Section Method, Iteration Method,

UNIT-II

Solution of Algebraic and Transcendental Equations by Method of false position, Newton-Rophson Method, Generalized Newton's Method, Mullers Method .

UNIT-III

Errors in Polynomial interpolation, Forward differences, Backward differences, Central differences, Symbolic relations, detection of errors by using difference tables, Newton's Interpolation formulae Guass Central difference formulae, Stirling's formulae,

UNIT- IV.

Interpolation with unevenly spaced points, Lagrange's interpolation formulae, error in Lagrange's formulae, Newton's Divided Differences and their properties, Curve fitting-Squares curve fitting procedures, fitting a straight line, nonlinear curve fitting, curve fitting by a sum of exponentials.

Text Book: Introductory Methods of Numerical Analysis By. S.S Sastry.

Reference Book: 1. Numerical Analysis , By M.K.Jain, and S.R.K Ayyanger
2. Finite Differences and Numerical Analysis by H.C.Saxena.
3. Telugu Academy Numerical Analysis.

NIZAM COLLEGE(AUTONOMOUS)::OSMANIA UNIVERSITY
DEPARTMENT OF MATHEMATICS
B.SC.IIIrd YEAR – VI -SEMSTER
PAPER-VIII(A) - NUMERICAL ANALYSIS

UNIT-I

Derive Newton's forward and backward difference formulae for Numerical Differentiation and applications.

UNIT-II

Numerical Integration- Trapezoidal Rule, Simpson's 1/3 rd and $3/8^{th}$ Rule, Book's and Weddle's rule, Romberg Integration, Numerical Double Integration.

UNIT-III

System of Linear Equations – Direct Methods, Matrix inversion Method, Gauss Elimination, Method of factorization (Gauss Jordan Method of factorization). Ill-Conditioned Linear Systems, Iterative methods- Jacobi and Gauss- Siedal Methods.

UNIT-VI

Numerical Solutions of Ordinary Differential Equations, Taylor's Series Method, Pickard's Method of Successive approximations, Euler's Method, Error estimation in Euler's Method, Range – Kutta Methods, Predictor-Corrector Methods, Milne's Method.

Text Book: Introductory Methods of Numerical Analysis By. S.S Sastry.

Reference Book: 1. Numerical Analysis , By M.K.Jain, and S.R.K Ayyanger
2. Finite Differences and Numerical Analysis by H.C.Saxena.
3. Telugu Academy Numerical Analysis.

NIZAM COLLEGE (AUTONOMOUS):: OSMANIA UNVERSITY
Pattern of Theory Question Paper :: B.Sc.I/II/ III year
Subject: MATHEMATICS Paper - _____

Duration of the Examination : 2 hours
Maximum Marks : 40 Marks

SECTION – A (4x2 = 08 Marks)

It consists of FIVE short answer questions (Choosing at least one question from each unit). Student has to answer Any FOUR questions

1.
2.
3.
4.
5.

SECTION – B (08 x 4 = 32 Marks)

Taking one question from each Unit

6. (a)
(b)

OR

(a)
(b)

7. (a)
(b)

OR

(a)
(b)

8. (a)
(b)

OR

(a)
(b)

9. (a)
(b)

OR

(a)
(b)