Mathematics

DEGREE STANDARD

UNIT I
Basic Mathematics:
Binomial, Exponential, Logrithmic series, summation of infinite series and approximation promblems. L Hospitals' rule, point wise convergence of sequence of functions, uniform convergence of sequences of funcitons, Consequences of Uniform convergence, Taylor's series.
Theory of numbers :
Prime and Composite numbers - Decomposition of composite number, Divisor of N, Euler function (N), Highest power of prime p contained in N. Divisibility of the product of r consecutive integers by r! Format's & Wilson's Theorems.
Vector Spaces & Inner product spaces :
Definitions and euqation of Vector space, subspace, liner Independence - bases - Dimension, Dual spaces, Inner products Spaces Orthogonality - Orthogonal complement.

UNIT II
ANALYTICAL GEOMETRY:
Pairs of Straight lines - Angle between them - related problems - conditions for second degree equation to represent pair of straight line or Circle - System of Circles - Orthogonal and Coaxial system - Radical axis and radical centre - Limiting point - conics - parabola, ellipse and hyperbola - polar equations to straight line, circle and conic.
Dimensions :
Equation of a sphere with given centre and radius - General form of the euqation of a sphere - Diameter from - Circular section, tangent plane to a sphere - Radical plane - Coaxial system of spheres - Orthogonality - Equation of a Cone with its Vertex at the origin - Equation of a quadratic cone with given vertix and given guiding curve - necessary and sufficient condition for a general second degree equation to represent a cone, right circular cone - euqation of enveloping cone - general equation of a cylider - right circular cylinder.

UNIT III
CALCULUS:
Differential:-
Higher order derivatives Leibnitz's theorem - simple problems using the above theorem. Maxima and Minima - conditions for external value - Standard function only - curvature - radius of curvature (Cartesian Co-ordinates only)
Partial Differentiation:
Total differentiation Coefficieng, Valvue of dy/dx and d2y/dx2 in case of implicit functions in x and y in terms of partial derivatives, Total differential, Jacobians.
Integral:
Methods of integration, Integration of rational and irrational algebraic functions, Bernaulli's formula for Integration by parts, reduction formulae - properties of difinite Integrals.
Evaluation of double and triple integrals, change of order of integration, Double Integrals in polar Co-ordinates, application of double & triple Integrals to area, volume. Evaluation of Define integrals using Beta and gamma functions.

UNIT IV
STATICS:
Gradient, Divergence, Curl, solenoidal & irrotational vectors, Directional derivative, Unit vector normal to a surface, tangent and normal planes to a surface 2, expansion formulea, Ordinary integrals of Vectors, line integrals, surface intergrals and volume Integrals. Gass stock, Green's theorems.
Parallelogram and Triangle laws of force, Lamis theorem, parallel forces, moments, couples, three forces acting on a rigid body, conditons for equiliburium of Co-planar forces.
Forces in 3 dimensions, Invariance of F2, Friction, Centre of Gravity, method of symmetry for uniformbodies like thin rod, thin parallelogram, Circular ring & lamina triangular lamina, trapezium lamina.

UNIT V
REAL ANALYSIS:
Set and functions, sequences of real numbers - Definition, Limit, Convergent and divergent sequences, bounded sequences, monotonice sequence, series of real numbers, limit superior, Limit inferior, Cauchy, Sequence, convergent & divergent sequence, series with non-negative terms, alternating series.
Series of real numbers:
rearrangement of series, Tests of absolute Covergence.
Limits & matric spaces:
Limit of a function on the real line, matric spaces, limits in matric spaces. Continuous functions on matric spaces, functions continuous at a point on the real line, reformulation, function continious on a matric space, open sets, closed sets, Discontinuous functions on 'R' Connectedness, Complexness and Compactness.

UNIT VI
OPERATIONS RESEARCH AND LINER PROGRAMMING:
Origin and development of O.R. - Nature and characteristics of O.R. Models in O.R. General solutions, methods for O.R. models - uses and limitations of O.R.
Linear Programming:
Formulation of problems, Graphical solution - standard form. Definition of basic solution. degenerate Simplex method, Definition of artifical variable.
Tranportation problem:
Definition solutions to transport problem - intial feasible solution - optimality test - Degenerary - Travelling sales man problem
Sequencing:
Processing n jobs through m machines.

UNIT VII
ALGEBRA:
Set theory - Relations - types of relations - Venn diagram - Groups - Sub group - order of an element - cyclic groups - normal groups-quotient groups - order of a Group Lagrange's theorem - homomorphism, automorphims, Cayley's theorm of permutation groups.
Rings:
Definition, examples - special classes of rings - Homomorphism, ideals and quotient rings - field of quotients of an integral domain - Euclidean rings.
Matrices:
Types of matrices - operation on matrices, singular and non singular matrices - Rank of a matrix and consistence of equation, eigen values & eigen vectors. Cayley - Hamilton theorem. Similar matrices, Diagonalisation of a matrix.

UNIT VIII
DIFFERENTIAL GEOMETRY:
Curvature, Radius and centre of curvature in Cartesian Co-ordinates, Evalute - curvature in Polar Co-ordinates, p-r equations, Angle between radius vector and tangent, Angle of intersection of two curves. Pedal equation of a curve, Envelopes, Asymptotes.
Polar Co-ordinates :
Equations of straight line, Circle in polars - equations of tangent, normal & polar Equations of Conics in polars - equations of tangent, normal, polar & asymptotes.

UNIT IX
DIRRERENTIAL EQUATIONS:
Ordinary differential equations - first order but not of first degree. Total differntial equation Pdx + Qdy + Rdz = 0, second order differential equations with constant Co-efficients. P.I. for the polynomials and $e^{ax}v$, where V is X^n, Cos mx, Sin mx, n and m are constants. Differential equations of second order with variable Co-efficients. Partial differential equations - formation of partial differential equations by elimination - Laplace transforms - Inverse laplace transform.

UNIT X

Dynamics:

Virtual displacement, Principle of Virtual work.

Kinematic:

Velocity, Acceleration, components of velocity and acceleration work power, energy, Ractilinear motion - motion with constant acceleration - motion under gravity - motion along an inclined plane, motion under gravity in a resisting medium.

Implusive forces and Impact:

Implusive forces and Impact, Principles of Conservation of linear momentum, Collison of two smooth spheres - Direct impact of sphere on a fixed plane.

Projectiles: Two dimensions motion of a particle - projectile, range on a horizontal plane - range on an inclined plane.

Circular motion of a particle:

Motion of a particle constrained to move along a smooth verticle circle under gravity - circular pendulum - simpel pendulum.

Moments of Inertia:

Momentsof Inertia of simple bodies of paralle and perpendicular axed theorem. Motion of a rigid body about a fixed axis.

UNIT XI

STATISTICS:

Frequency distributions - Graphs of frequency distribution, measures of central tendency, measures of dispresion, normal probability curve, skewness, kur tosis, Probability - Addition and multiplicaiton theorem. Baye's theorem.

Probability Distributions :

Binomial, Poisson, Normal Bivariate data, Curve fitting - Method of least squares. Correlation and regression Coefficient - Regression lines - rank Correlation. Test of hypothesis - uses of X2 - F tests - Tests involving means - Variances and proportions test of fit, test of independence in contingency table.