Mathematics

Linear Algebra

Vector space, bases, dimension of a finitely generated space, Linear Transformations, Rank and nullity of a linear transformation, Cayley-Hamilton theorem, Eigenvalues and Eigen vectors.


Orthogonal, Symmetrical, skew-symmetrical, unitary, Hermitian and skew-Hermitian matrices-their eigenvalues, orthogonal and unitary reduction of quadratic and Hermitian forms. Positive definite quadratic forms, simultaneous reduction.

Calculus:

Real numbers, limits, continuity, differentiability, Mean-value theorem, Taylor’s theorem, indeterminate forms, Maxima and Minima, Curve Tracing.

Asymptotes :

Functions of several variables, partial derivatives maxima and minima, Jocobian. Definite and indefinite integrals, Double and triple integrals (techniques only). Application to Beta and Gamma Functions. Areas, Volumes; centre of gravity.

Analytic Geometry of Two and Three Dimensions

First and second degree equations in two dimensions in Cartesian and polar coordinates, Plane, sphere, paraboloid, Ellipsoid, hyperboloid of one and two sheets and their elementary properties, curves in space, curvature and torsion, Frenet’s formulae.

Differential Equations :

Order and Degree of a differential equation; differential equation of first order and first degree, variables separable. Homogeneous, linear and exact differential equations. Differential equations with constant coefficients. The complimentary function and the particular integral of e^{ax}, \cos ax, \sin ax, x^n, e^{ax}, \cos bx, e^{ax}, \sin bx.

Vector, Tensor, Statics, Dynamics and Hydrostatics


(iii) Statics - Equilibrium of a system of particles, work and potential energy. Friction, Common category. Principles of Virtual work. Stability of equilibrium. Equilibrium of forces in three dimensions,

(v) Hydrostatics - Pressure of heavy fluids, Equilbirum of fluids under given system of forces. Centre of pressure Thrust on curved surfaces. Equilibrium of floating bodies. Stability of equilibrium and Pressure of gases, problems of relating to atmosphere.

Section - A: Algebra, Real Analysis, Complex Analysis, Partial differential equations.

Section - B: Mechanics, Hydrodynamics, Numerical Analysis, Statistics including probability. Operational research.

Algebra: Group, Sub-groups, normal sub-groups, homomorphism of groups, quotient groups. Basic isomorphism theorems. Sylow theorems. Permutation Groups. Cayley’s theorem. Rings and ideals, Principal ideal domains, unique factorization domains and Euclidean domains. Field Extensions, finite fields.


Mechanics: Generalised Co-ordinates, Constraints, holonomic and non-holonomic systems, D’Alembert’s principle and Langranges’ equations, Moment of Inertia, Motion of rigid bodies in two dimension.

Hydrodynamics: Equation of continuity, momentum and energy, Inviscid Flow Theory: Two dimensional motion, Streaming motion, sources and Sinks.


Numerical Intergration: Problems of approximate quadrative, quadrature formulae with equispaced arguments, Caussian quadrature Convergence.


**Probability** : Discrete sample space, Events, their union and intersection etc. Probability - Classical relative frequency and exiomatic approaches, Probability in continuum, Probability space conditional probability and independence, Basic laws of Probability, Probability of combination of events, Bayes theorem, Random variable Priobability function, Probability density function, Distribution function, Mathematical expectation, Marginal and conditional distributions, conditional expectation.

**Probability distributions** : Binomial, Poison, Normal Gamma, Beta, Cauchy, Multinomial, Hypergeometric, Negative Bionomial, Chebychev's lemma (Weak) law of large numbers, Central limit theorem for independent and identical varieties. Standard errors, Sampling distribution of to Fand Chi-square and their uses interests of significance. Large sample tests for mean and proportion.

**Operational Research** :

Deterministic replacement models, Sequencing problems with two machines n jobs, 3 machines, n jobs (Special case) and n machines 2 jobs.


**Director**
**Directorate of Minorities**
**Bangalore**