Syllabus for Adani University Research Entrance Test (ARET)

Mathematics

Faculty of Science

Analysis and Abstract Algebra: Set theory, Real number system, Sequences and series, Convergence, Functions of single and more than one variable, Continuity, Total and Partial Differentiation, Application of Partial Derivatives, Improper and Multiple integrals, Vector Calculus - gradient, divergence and curl, Line and Surface integrals, Green's and Stokes' theorem, Gauss' divergence theorem, Metric spaces, Normed linear spaces, Banach spaces, Hilbert spaces. Group, Ring, Field and Integral Domain.

Linear Algebra: Matrices, Finite dimensional vector spaces over real and complex fields, Linear transformations and their matrix representations, Systems of linear equations, Eigenvalues and eigenvectors, Diagonalization, Finite dimensional inner product spaces, Bilinear and quadratic forms.

Complex Analysis: Functions of a complex variable, Continuity, Differentiability, Analytic functions, Complex integration, Zeros and singularities, Power series, Radius of convergence, Taylor's and Laurent's series, Residue theorem.

Ordinary Differential equations: First order ODEs, Linear ODEs of higher order with constant coefficients, Higher order linear ODEs with variable coefficients, Cauchy-Euler equation, Method of Laplace transforms for solving ODEs, Series solutions, Legendre and Bessel functions, Systems of linear first order ODEs.

Partial Differential Equations: Lagrange's and Charpit's methods for solving first order PDEs, Cauchy problem, Classification of second order PDEs, General solution of higher order PDEs with constant coefficients, Method of separation of variables for Laplace, Heat and Wave equations.

Numerical Analysis: Systems of linear equations: Direct methods, Iterative methods, Bisection and Secant method, Newton-Raphson method, Fixed point iteration, Lagrange's and Newton's interpolation, Error in interpolation, Numerical differentiation and error, Trapezoidal and Simpson rules, Newton-Cotes integration, Error in numerical integration, Euler Method, Runge-Kutta method of order 2.

Linear Programming: Linear programming models, Graphical, Simplex and Two-phase methods, Duality theory, Assignment problems, Hungarian method.

Janani Bandyopadhyay

Signature of HoD/Dean