
Numerical Analysis A

Finalità

Finalità (massimo 400 caratteri)

introduction to some methods and algorithms of Numerical Analysis, useful in the context of Mathematics applied to Engineering problems.

Programma

Numerical linear algebra

Condition number of linear systems. Triangular system solution. Gaussian Elimination. Pivoting technique. Gaussian decomposition and PA=LU factorization.. Determinant and inversion of a square non-singular matrix. Algorithms for tridiagonal matrices. Positive definite matrices. Cholesky factorization. Iterative methods. Jacobi method : algorithm and convergence conditions.

Data fitting and functions approximation

Polynomial interpolation. Lagrange and Newton forms of the interpolating polynomial. Hermite interpolation. Polynomial interpolation error. Conditioning of polynomial interpolation: Lebesgue function and constant. Piece-wise polynomial interpolation. Linear and cubic splines interpolation Convergence results. Trigonometric interpolation. Least squares approximation.

Numerical solution of non-linear equations

Conditioning of a non-linear equation. Bisection method: algorithm and convergence result. Newton's method. Local convergence result. Rate of convergence. Stop tests. Other linearization techniques.

Numerical integration

Interpolatory numerical integration. Degree of precision. Closed Newton-Cotes formulas. Quadrature error. Iterated quadrature formulas. Convergence results.

Numerical methods for Ordinary Differential Equations

One-step explicit methods. Runge-Kutta methods. Convergence results. Estimate of local truncation error and choice of integrating step.

Attività d'esercitazione

Exercises, complements and numerical applications

Modalità d'esame

Written exam

Testi consigliati

G. MONEGATO, Fondamenti di Calcolo Numerico, CLUT, 1998

A. QUARTERONI, R. SACCO, F. SALERI, Matematica Numerica, SPRINGER,1998

G. NALDI, L. PARESCHI, G. RUSSO, Introduzione al Calcolo Scientifico. Metodi e applicazioni con Matlab, MC GRAW-HILL, 2001

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