

Griepentrog, Eberhard; März, Roswitha

Differential-algebraic equations and their numerical treatment. (English) Zbl 0629.65080

Teubner-Texte zur Mathematik, Bd. 88. Leipzig: BSB B. G. Teubner Verlagsgesellschaft. 220 p. M 22.50 (1986).

In the first part of this monograph the authors deal with theoretical results on differential-algebraic equations $f(x'(t), x(t), t) = 0$ where the nullspace of the Jacobian $f'_y(y, x, t)$ depends only on time and is of constant dimension. A transferability condition is used to characterize a well posed problem by transforming the problem to an equivalent system of state equations.

The second part deals with numerical methods for the initial value problem for differential-algebraic equations. A detailed analysis is given for implicit Runge-Kutta methods with a thorough treatment of stability properties. Corresponding results are obtained for multistep methods and for one leg methods. The final, comparatively brief, section deals with boundary value problems. Attention is restricted to the use of one step methods.

Reviewer: G.J.Cooper

MSC:

- 65L05 Numerical methods for initial value problems involving ordinary differential equations
- 34A34 Nonlinear ordinary differential equations and systems
- 65H10 Numerical computation of solutions to systems of equations
- 65L20 Stability and convergence of numerical methods for ordinary differential equations
- 34-02 Research exposition (monographs, survey articles) pertaining to ordinary differential equations
- 34B15 Nonlinear boundary value problems for ordinary differential equations
- 65-02 Research exposition (monographs, survey articles) pertaining to numerical analysis

Cited in **6** Reviews
Cited in **136** Documents

Keywords:

monograph; differential-algebraic equations; numerical methods; Runge-Kutta methods; multistep methods; one leg methods; one step methods