

Vitaliani, Renato V.; Gasparini, Alessandro M.; Saetta, Anna V.

Finite element solution of the stability problem for nonlinear undamped and damped systems under nonconservative loading. (English) Zbl 0939.74601

Int. J. Solids Struct. 34, No. 19, 2497-2516 (1997).

Summary: A nonlinear finite element analysis of elastic structures which can be studied by a 3D beam theory, subjected to conservative as well as to nonconservative forces, is presented. The stability behaviour of the system is studied by means of an eigenvalue analysis. The stiffness matrix of the eigenvalue problem is asymmetric (i.e., non-self-adjoint system). The flutter and divergence modes of instability, as well as the values of the critical load, are identified for a number of numerical examples belonging to the benchmark tests proposed by NAFEMS (1990). The results demonstrate the reliability of this finite element formulation. In particular the effect of damping on the stability behaviour of such structures is investigated and the destabilizing effect of small damping is underlined. Finally, the need to define a number of benchmark tests for nonlinear-nonconservative analyses in presence of damping is included.

MSC:

74S05 Finite element methods applied to problems in solid mechanics

74H55 Stability of dynamical problems in solid mechanics

74H99 Dynamical problems in solid mechanics

74K10 Rods (beams, columns, shafts, arches, rings, etc.)

Cited in **5** Documents

Full Text: [DOI](#)