

Upadhyay, A. K.; Pandey, Ramesh; Shukla, K. K.

Nonlinear dynamic response of laminated composite plates subjected to pulse loading.
(English) [Zbl 1392.74046](#)

Commun. Nonlinear Sci. Numer. Simul. 16, No. 11, 4530-4544 (2011).

Summary: An analytical solution methodology for the nonlinear dynamic displacement response of laminated composite plates subjected to different types of pulse loading is presented. The mathematical formulation is based on third-order shear deformation plate theory and von-Karman nonlinear kinematics. Fast-converging finite double Chebyshev series is employed for evaluating the displacement response. Houbolt time marching scheme is used for temporal discretization and quadratic extrapolation technique is used for linearization. The effects of magnitude and duration of the pulse load, boundary conditions and plate parameters on the central displacement and bending moment responses are studied.

MSC:

74H10 Analytic approximation of solutions (perturbation methods, asymptotic methods, series, etc.) of dynamical problems in solid mechanics

Cited in **3** Documents

74K20 Plates

74E30 Composite and mixture properties

Keywords:

analytical solution; third-order shear deformation theory; von-Karman nonlinear kinematics; Chebyshev series; Houbolt time marching scheme

Full Text: [DOI](#)

References:

- [1] Reddy, J.N., Geometrically nonlinear transient analysis of laminated composite plates, *Aiaa*, 21, 621-629, (1983) · [Zbl 0506.73074](#)
- [2] Birman, V.; Bert, C.W., Behavior of laminated plates subjected to conventional blast, *Int J impact eng*, 6, 145-155, (1987)
- [3] Librescu, L.; Nosier, A., Response of laminated composite flat panels to sonic boom and explosive blast loadings, *Aiaa*, 28, 2, 345-352, (1990) · [Zbl 0724.73115](#)
- [4] Tsouvalis, N.G.; Papazoglou, V.J., Large deflection dynamic response of composite laminated plates under lateral loads, *Mar struct*, 9, 825-848, (1996)
- [5] Turkmen, H.S.; Mecitoglu, Z., Nonlinear structural response of laminated composite plates subjected to blast loading, *Aiaa*, 37, 12, 1639-1647, (1999)
- [6] Chen, J.; Dawe, D.J.; Wang, S., Non-linear transient analysis of rectangular composite laminated plates, *Compos struct*, 49, 129-139, (2000)
- [7] Ramajeyathilagam, K.; Vendhan, C.P.; Rao, V.B., Non-linear transient dynamic response of rectangular plates under shock loading, *Int J impact eng*, 24, 999-1015, (2000)
- [8] Nath, Y.; Shukla, K.K., Non-linear transient analysis of moderately thick laminated composite plates, *J sound vib*, 247, 3, 509-526, (2001)
- [9] Librescu, L.; Oh, S.Y.; Hohe, J., Linear and non-linear dynamic response of sandwich panels to blast loading, *Compos part B*, 35, 673-683, (2004)
- [10] Hause, T.; Librescu, L., Dynamic response of anisotropic sandwich flat panels to explosive pressure pulses, *Int J impact eng*, 31, 607-628, (2005)
- [11] Kazancı, Z.; Mecitoglu, Z., Nonlinear damped vibrations of a laminated composite plate subjected to blast load, *Aiaa*, 44-9, 2002-2008, (2006)
- [12] Kazancı, Z.; Mecitoglu, Z., Non-linear dynamic behavior of simply supported laminated composite plates subjected to blast load, *J sound vib*, 317, 883-897, (2008)
- [13] Kant, T.; Swaminathan, K., Analytical solutions for free vibration of laminated composite and sandwich plates based on a higher order refined theory, *Compos struct*, 53, 73-85, (2001)
- [14] Fox, L.; Parker, I.B., *Chebyshev polynomials in numerical analysis*, (1968), Oxford University Press London · [Zbl 0153.17502](#)
- [15] Houbolt, J.C., A recurrence matrix solution for the dynamic response of elastic aircraft, *J aero sci*, 17, 540-550, (1950)

This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.