عنوان مقاله:

Using spectral finite element method for time domain analysis of Timoshenko beam under concentrated impulse load

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خلاصه مقاله:

In this article, FFT-based spectral finite element (FSFE) is formulated for time domain analysis of Timoshenko beam subjected to a concentrated impulse load. The formulation of FSFE for a structure element is fairly similar to the formulation of the conventional finite element (FE) models. However, the major difference is that in general FSFE formulation begins with transforming the time domain governing partial differential equations of motion into the frequency domain ordinary differential equations by using the FFT. Then, exact dynamic stiffness matrix called the spectral element matrix is finally formulated by using the force-displacement relation method. Global system equation can be obtained after assembling all spectral elements and imposing associated boundary conditions on the assembled set of equations, like FE method. Finally, solution of the assembled global system equation map to time by applying inverse FFT (or IFFT). FSFE method in contrast to FE method can give exact solution without the need to divide the structure member into many finite elements. The high accuracy of FSFE model is then evaluated by comparing its results with those of FE model results.

کلمات کلیدی:

Timoshenko beam, FFT-based spectral finite element method, conventional finite element method, concentrated impulse load, spectral element matrix, time domain analysis

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