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Nonlinear Analysis of Shear Deformable Deep Beam Resting on Nonlinear Two-Parameter Random Soil

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Abstract : In this paper, the nonlinear analysis of Timoshenko beam undergoing moderate large deflections and resting on nonlinear two-parameter random foundation is presented, taking into account the effects of shear deformation, beam's properties variation and the spatial variability of soil characteristics. The finite element probabilistic analysis has been performed by using Timoshenko beam theory with the Von Kàrmàn nonlinear strain-displacement relationships combined to Vanmarcke theory and Monte Carlo simulations, which is implemented in a Matlab program. Numerical examples of the newly developed model is conducted to confirm the efficiency and accuracy of this later and the importance of accounting for the foundation second parameter (Winkler-Pasternak). Thus, the results obtained from the developed model are presented and compared with those available in the literature to examine how the consideration of the shear and spatial variability of soil's characteristics affects the response of the system.

Keywords : nonlinear analysis, soil-structure interaction, large deflection, Timoshenko beam, Euler-Bernoulli beam, Winkler foundation, Pasternak foundation, spatial variability
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