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Three Dimensional Vibration Analysis of Carbon Nanotubes Embedded in Elastic Medium

Authors : M. Shaban, A. Alibeigloo

Abstract : This paper studies free vibration behavior of single-walled carbon nanotubes (SWCNTs) embedded on elastic medium based on three-dimensional theory of elasticity. To accounting the size effect of carbon nanotubes, nonlocal theory is adopted to shell model. The nonlocal parameter is incorporated into all constitutive equations in three dimensions. The surrounding medium is modeled as two-parameter elastic foundation. By using Fourier series expansion in axial and circumferential direction, the set of coupled governing equations are reduced to the ordinary differential equations in thickness direction. Then, the state-space method as an efficient and accurate method is used to solve the resulting equations analytically. Comprehensive parametric studies are carried out to show the influences of the nonlocal parameter, radial and shear elastic stiffness, thickness-to-radius ratio and radius-to-length ratio.

Keywords : carbon nanotubes, embedded, nonlocal, free vibration
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