Geomechanics and Engineering Volume 22 Issue 1

Impact of the homogenization models on the thermoelastic response of FG plates on variable elastic foundation

Rachedi, Mohamed Ali (Material and Hydrology Laboratory, University of Sidi Bel Abbes, Faculty of Technology) ; Benyoucef, Samir (Material and Hydrology Laboratory, University of Sidi Bel Abbes, Faculty of Technology) ; Bouhadra, Abdelhakim (Material and Hydrology Laboratory, University of Sidi Bel Abbes, Faculty of Technology) ; Bouiadjra, Rabbab Bachir (Material and Hydrology Laboratory, University of Sidi Bel Abbes, Faculty of Technology) ; Sekkal, Mohamed (Material and Hydrology Laboratory, University of Sidi Bel Abbes, Faculty of Technology) ; Benachour, Abdelkader (Material and Hydrology Laboratory, University of Sidi Bel Abbes, Faculty of Technology)

Received : 2020.03.31, Accepted : 2020.05.23 ,Published : 2020.07.10 https://doi.org/10.12989/gae.2020.22.1.065 Copy Citation KSCI

Abstract

This paper presents a theoretical investigation on the response of the thermo-mechanical bending of FG plate on variable elastic foundation. A quasi-3D higher shear deformation theory is used that contains undetermined integral forms and involves only four unknowns to derive. The FG plates are supposed simply supported with temperature-dependent material properties and subjected to nonlinear temperature rise. Various homogenization models are used to estimate the effective material properties such as temperature-dependent thermoelastic properties. Equations of motion are derived from the principle of virtual displacements and Navier's solution is used to solve the problem of simply supported plates. Numerical results for deflections and stresses of FG plate with temperature-dependent material properties are investigated. It can be concluded that the proposed theory is accurate and simple in solving the thermoelastic bending behavior of FG thick plates.

Keywords

quasi-3D solution; FG thick plates; homogenization models; temperature-dependent material; thermo-mechanical bending