

عنوان مقاله:

Application of a New Cylindrical Super-element in Free Vibration Analysis of Ring Stiffened Functionally Graded Thick Walled Cylinders

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خلاصه مقاله:

Structural behavior of ring stiffened thick walled cylinders made of functionally graded materials (FGMs) is investigated in this paper. Functionally graded materials are inhomogeneous composites which are usually made from a mixture of metal and ceramic. The gradient compositional variation of the constituents from one surface to the other provides an elegant solution to the problem of high transverse shear stresses that are induced when two dissimilar materials with large differences in material properties are bonded. FGM formation of the cylinder is modeled by powerlaw exponent and the variation of characteristics is supposed to be in radial direction. A finite element formulation is derived for the analysis. According to the property variation of the constituent materials in the radial direction of the wall, it is not convenient to use conventional elements to model and analyze the structure of the stiffened FGM cylinders. In this paper a new cylindrical super-element is used to model the finite element formulation and analyze the static and modal behavior of stiffened FGM thick walled cylinders. By using this super-element the number of elements, which are needed for modeling, will reduce significantly and the process time is less in comparison with conventional finite element formulations. Results for static and modal analysis are evaluated and verified by comparison to finite element formulation with conventional elements. Comparison indicates a good conformity between results.

کلمات کلیدی:

FGMs, Modal analysis, Static analysis, Stiffened cylinders

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