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Impact of interlayer on the anisotropic multi-layered medium overlaying viscoelastic layer under axisymmetric loading. (English) Zbl 1460.74017

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Summary: Multi-layered media is the most common structure in artificial and natural surroundings, and it is considered as a good candidate for mathematical model. The anisotropic properties and viscoelastic properties of layer materials have been widely used in multi-layered medium. Furthermore, the interlayer condition between the layers also plays an important role in the mechanical behavior of multi-layered medium. Despite many numerical approaches having been applied in these analyses, only few analytical solution were developed to analyze the effects of these three issues at the same time. The objective of this study is to develop an analytical solution that can be used for analyzing the impact of interlayer conditions on the mechanical behavior of anisotropic multi-layered medium overlaying viscoelastic layer subjected to axisymmetric loading, but the anisotropy property was approximated as transversely isotropy. The interlayer condition between the adjacent layers will also be considered. Details of the mathematical derivation, implementation and verification of the proposed analytical solution were presented. Subsequent numerical results demonstrate that both viscoelastic, transverse isotropy and interlayer condition could substantially contribute to the mechanical behavior of the multi-layered medium.

MSC:

74E30 Composite and mixture properties

74E10 Anisotropy in solid mechanics

74D05 Linear constitutive equations for materials with memory

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Keywords:

interlayer condition; transverse isotropy; analytical solution

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