THE STABILITY OF FUNCTIONALLY GRADED CYLINDRICAL THIN SHELLS

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Functionally graded materials (FGMs) are increasingly being considered in various applications to maximize strengths and integrities of many engineering structures since they were first reported in 1984 in Japan. FGMs are composite materials, microscopically inhomogeneous, in which the mechanical properties vary smoothly and continuously from one surface to the other. This is achieved by gradually varying the volume fraction of the constituent materials.

In this study, a formulation for the stability of cylindrical thin shells made of functionally graded material (FGM) subjected to torsional loading varying as a linear function of time is presented. The properties are graded in the thickness direction according to a volume fraction power-law distribution. The modified Donnell type dynamic stability and compatibility equations are obtained. Applying Galerkin's method then applying Ritz type variational method to these equations taking the large values of loading parameters into consideration, analytic solutions are obtained for critical parameter values. The results show that the dynamic critical torsional load and critical impulse is affected by the configurations of the constituent materials variations. Comparing results with those in the literature validates the present analysis.

References

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