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Selected Publications with Abstracts:

Abdullah H. Sofiyev (Department of Civil Engineering, Suleyman Demirel University, Isparta, Turkey), “The buckling of an orthotropic composite truncated conical shell with continuously varying thickness subject to a time dependent external pressure”, Composites Part B: Engineering, Vol. 34, No. 3, April 2003, pp. 227-233, doi:10.1016/S1359-8368(02)00105-1

ABSTRACT: In this study, the buckling of an orthotropic composite truncated conical shell with continuously varying thickness, subject to a uniform external pressure which is a power function of time, has been considered. At first, the fundamental relations and the Donnell type stability equations of an orthotropic composite truncated conical shell, subject to an external pressure, have been obtained. Then, employing Galerkin method, those equations have been reduced of time dependent differential equation with variable coefficients. Finally, applying the variational method of Ritz method type, the critical static and dynamic loads, the corresponding wave numbers and the dynamic factor have been found analytically. Using those results, the effects of the variations of the power in the thickness expression, the semi-vertex angle, the power of time in the external pressure expression and the ratio of the Young's moduli on the critical parameters are studied numerically, for the case when the thickness of the conical shell varies as a power and exponential function. It is observed, from the computations carried out, that these factors have appreciable effects on the critical parameters of the problem in the heading.

ABSTRACT: The subject of this investigation is to study the buckling of cross-ply laminated orthotropic truncated circular conical thin shells with variable Young's moduli and densities in the thickness direction, subjected to a uniform external pressure which is a power function of time. After obtaining the dynamic stability and compatibility equations we reduce both of them to a time dependent ordinary differential equation with variable coefficient by using Galerkin's method. The critical dynamic and static loading, the corresponding wave numbers, the dynamic factors, critical time and critical impulse are found analytically by applying the Ritz type variational method. The dynamic behavior of cross-ply laminated truncated conical shells is investigated with: (a) lamina that present variations in the Young's moduli and densities, (b) different numbers and ordering of layers, (c) variable semi-vertex angles, and (d) external pressures which vary with different powers of time. It is concluded that all these factors contribute to appreciable effects on the critical parameters of the problem in question.


ABSTRACT: This study considers torsional buckling of cross-ply laminated orthotropic composite cylindrical thin shells under loads, which is a power function of time. The modified Donnell type dynamic stability and compatibility equations are obtained first. These equations are subsequently reduced to a time dependent differential equation with variable coefficients by using Galerkin's method. The critical parameters are found analytically by applying the Ritz type variational method. According to theoretical solutions, numerical analyses are done.

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ABSTRACT: The buckling of laminated orthotropic cylindrical thin shells under torsion, which is a linear function of time, has been investigated. First, fundamental relations and the modified Donnell type stability equations of the laminated cylindrical thin shells are derived. Applying Galerkin’s method, a differential equation having a variable coefficient depending on time is obtained and by applying the Ritz-type variational method to these equations, general formulas for static and dynamic critical loads, corresponding wave numbers and the dynamic factor are obtained. Finally after performing the computations, the effects of the variations of the numbers and ordering of layers, loading speed, and the ratio of radius to thickness on the critical parameters are investigated.

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ABSTRACT: This study considers the buckling of an elastic truncated conical shell having a meridional thickness expressed by an arbitrary function, subject to a uniform external pressure, which is a power function of time. At first, the fundamental relations and Donnell type dynamic buckling equation of an elastic conical
shell with variable thickness have been obtained. Then, employing Galerkin's method, those equations have been reduced to a time-dependent differential equation with variable coefficients. Finally, applying the Ritz type variational method, the critical static and dynamic loads, the corresponding wave numbers, dynamic factor and critical stress impulse have been found analytically. Using the results, thus obtained, the effects of the thickness variations with a power or an exponential function, the variation of the semi-vertex angle and the variation of the power of time in the external pressure expression are studied through pertinent computations. It is observed that these factors have appreciable effects on the critical parameters of the problem in the heading.

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ABSTRACT: 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 Lagrange–Hamilton type principle to these equations taking the large values of loading speed into consideration, analytic solutions are obtained for critical torsional parameters values. The results show that the critical torsional parameters are affected by the configurations of the constituent materials variations. Comparing results with those in the literature validates the present analysis.

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ABSTRACT: In this study, the stability problem of a circular orthotropic cylindrical shell under the effect of an axial compression varying with a power function of time is considered. At first, the modified Donnell type dynamic stability and compatibility equations are obtained using Love’s shell theory. Applying the Galerkin method and Rayleigh–Ritz variational techniques to these equations and taking the large values of loading parameters into consideration, analytics are obtained for critical parameter values. The results show that critical parameters are affected by loading parameters variations, ratio of the Young’s moduli variations, radius to thickness variations and the power of time in the axial compression expression variations. Comparing results with those in the literature validates the present analysis.


ABSTRACT: In this paper, the vibration and stability of a three-layered conical shell containing a functionally graded material (FGM) layer subjected to axial compressive load are studied. The material properties of the functionally graded layer are assumed to vary continuously through the thickness of the shell. The variation of
properties follow an arbitrary distribution in terms of the volume fractions of the constituents. The fundamental relations, the dynamic stability and compatibility equations of three-layered truncated conical shells containing an FGM layer are obtained first. Applying Galerkin's method, these equations are transformed to a pair of time dependent differential equations, and critical axial load and frequency parameter are obtained. The results show that the critical parameters are affected by the configurations of the constituent materials and the variation of the shell geometry. Comparing results with those in the literature validates the present analysis.

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ABSTRACT: The dynamic buckling of a cylindrical shell subject to a uniform axial compression, which is a linear function of time, is examined within the framework of small strain elasto-plasticity. The material of the shell is incompressible and the effect of the elastic unloading is not taken into consideration. Initially, employing the deformation theory, the fundamental relations and Donnell type stability equations have been obtained. Finally, by using the Galerkin’s methods the closed form solutions are presented. Comparing the results with those in the literature validates the present analysis.


ABSTRACT: The dynamic buckling of truncated conical shells made of functionally graded materials (FGMs) subject to a uniform axial compressive load, which is a linear function of time, has been studied. The material properties of functionally graded shells are assumed to vary continuously through the thickness of the shell. The variation of properties followed an arbitrary distribution in terms of the volume fractions of the constituents. The fundamental relations, the dynamic stability and compatibility equations of functionally graded truncated conical shells are obtained first. Applying Galerkin's method, these equations have been transformed to a pair of time dependent differential equation with variable coefficient and critical parameters obtained using the Runge-Kutta method. The results show that the critical parameters are affected by the configurations of the constituent materials, compositional profile variations, loading speed variations and the variation of the shell geometry. Comparing the results of this study with those in the literature validates the present analysis.

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ABSTRACT: In this study, the buckling of thin truncated conical shells made of functionally graded materials (FGMs) subjected to hydrostatic pressure is investigated. The material properties of functionally graded truncated conical shell are assumed to vary continuously through the thickness. The variation of properties followed an arbitrary distribution in terms of the volume fractions of the constituents. The fundamental relations, the stability and compatibility equations of FGM hybrid truncated conical shells are obtained. Using Galerkin's method, these equations were transformed to pairs of time-dependent differential equations and then hydrostatic buckling pressure expression was obtained. Numerical calculations have been made for fully metal, fully ceramic, Si3N4/Ni and ZrO2/Ti–6Al–4V truncated conical shells. The results reveal that the volume
fraction distributions have a significant effect on the buckling pressure of FGM hybrid truncated conical shells. Finally, results are validated through comparison of obtained values with those in the literature.

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ABSTRACT: In this paper, the vibration and stability of orthotropic conical shells with non-homogeneous material properties under a hydrostatic pressure are studied. At first, the basic relations have been obtained for orthotropic truncated conical shells, Young's moduli and density of which vary continuously in the thickness direction. By applying the Galerkin method to the foregoing equations, the buckling pressure and frequency parameter of truncated conical shells are obtained from these equations. Finally, carrying out some computations, the effects of the variations of conical shell characteristics, the effects of the non-homogeneity and the orthotropy on the critical dimensionless hydrostatic pressure and lowest dimensionless frequency parameter have been studied, when Young's moduli and density vary together and separately. The results are presented in tables, figures and compared with other works.

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ABSTRACT: In this paper, the free vibration and buckling of laminated homogeneous and non-homogeneous orthotropic truncated conical shells under lateral and hydrostatic pressures are studied. At first, the basic relations, the modified Donnell type dynamic stability and compatibility equations have been obtained for laminated orthotropic truncated conical shells, the Young's moduli and density of which vary piecewise continuously in the thickness direction. Applying superposition and Galerkin methods to the foregoing equations, the buckling pressures and dimensionless frequency parameter of laminated homogeneous and non-homogeneous orthotropic conical shells are obtained. The appropriate formulas for single-layer and laminated cylindrical shells made of homogeneous and non-homogeneous, orthotropic and isotropic materials are found as a special case. Finally, the effects of the number and ordering of layers, the variations of conical shell characteristics, together and separately variations of the Young's moduli and densities of the materials of layers on the critical lateral and hydrostatic pressures, and frequency parameter are found for different mode numbers. The results are compared with other works.

ABSTRACT: The purpose of this paper is to investigate the elastic buckling of FGM truncated thin conical shells under combined axial tension and hydrostatic pressure. Here axial tensions are separately applied to small and large bases of the truncated conical shell, respectively. It is assumed that the cone is a mixture of metal and ceramic, and that its properties changes as the power and exponential functions of the shell thickness. After
giving the fundamental relations, the stability and compatibility equations of an FGM truncated conical shell, subject to combined axial tension and hydrostatic pressure, have been derived. Applying Galerkin’s method general formulas have been obtained for the critical combined and separate loads of FGM conical shells. The appropriate formulas for homogenous and FGM cylindrical shells are found as a special case. Effects of changing shell characteristics, material composition and volume fraction of constituent materials on the critical combined and separate loads of FGM shells with simply supported edges are also investigated. The results obtained for homogeneous cases are compared with their counterparts in the literature.


ABSTRACT: In this study, the stability of cylindrical shells that composed of ceramic, FGM, and metal layers subjected to axial load and resting on Winkler-Pasternak foundations is investigated. Material properties of FGM layer are varied continuously in thickness direction according to a simple power distribution in terms of the ceramic and metal volume fractions. The modified Donnell type stability and compatibility equations on the Pasternak foundation are obtained. Applying Galerkin’s method analytic solutions are obtained for the critical axial load of three-layered cylindrical shells containing an FGM layer with and without elastic foundation. The detailed parametric studies are carried out to study the influences of thickness variations of the FGM layer, radius-to-thickness ratio, material composition and material profile index, Winkler and Pasternak foundations on the critical axial load of three-layered cylindrical shells. Comparing results with those in the literature validates the present analysis.

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ABSTRACT: In this paper an analytical procedure is given to study the free vibration and stability characteristics of homogeneous and non-homogeneous orthotropic truncated and complete conical shells with clamped edges under uniform external pressures. The non-homogeneous orthotropic material properties of conical shells vary continuously in the thickness direction. The governing equations according to the Donnell’s theory are solved by Galerkin’s method and critical hydrostatic and lateral pressures and fundamental natural frequencies have been found analytically. The appropriate formulas for homogeneous orthotropic and isotropic conical shells and for cylindrical shells made of homogeneous and non-homogeneous, orthotropic and isotropic materials are found as a special case. Several examples are presented to show the accuracy and efficiency of the formulation. The closed-form solutions are verified by accurate different solutions. Finally, the influences of the non-homogeneity, orthotropy and the variations of conical shells characteristics on the critical lateral and hydrostatic pressures and natural frequencies are investigated, when Young’s moduli and density vary together and separately. The results obtained for homogeneous cases are compared with their counterparts in the literature.

A.H. Sofiyev (Department of Civil Engineering, Suleyman Demirel University, 32260 Isparta, Turkey), “Influences of elastic foundations and boundary conditions on the buckling of laminated shell structures

ABSTRACT: This article presents to study the stability of laminated orthotropic cylindrical and truncated conical shells resting on elastic foundations and subjected to combined loads with the clamped and simply supported boundary conditions. Here, axial tensile loads separately applied to the small and large bases of a laminated truncated conical shell, respectively. The basic relations, the modified Donnell type stability and compatibility equations have been obtained for laminated orthotropic truncated conical shells on the Pasternak type elastic foundation. Applying Galerkin method, the critical combined loads of laminated orthotropic conical shells on the Pasternak type elastic foundation with different boundary conditions are obtained. The appropriate formulas for single-layer and laminated cylindrical shells on the Pasternak type elastic foundation made of orthotropic and isotropic materials are found as special cases. Finally, influences of the boundary conditions, the elastic foundation, the number and ordering of the layers and variations of the shell characteristics on the critical combined loads are investigated. The results are compared with their counterparts in the literature.