

## عنوان مقاله:

An Analytical Solution for Temperature Distribution and Thermal Strain of FGM Cylinders with Varying Thickness and Temperature-Dependent Properties Using Perturbation Technique

## محل انتشار:

مجله مکانیک کاربردی محاسباتی، دوره 51، شماره 1 (سال: 1399)

تعداد صفحات اصل مقاله: 13

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## خلاصه مقاله:

This research presents temperature distribution and thermal strain of functionally graded material cylinders with varying thickness and temperature-dependency properties that are subjected to heat fluxes in their inner and outer layers. The heterogeneous distribution of properties is modeled as a power function. Using first-order temperature theory and the energy method, governing equations are extracted. The system of governing differential equations is a system of nonlinear differential equations with variable coefficients, which are solved by using the analytical method of the matched asymptotic expansion of the perturbations technique. Results obtained from temperature distribution, heat flux, and thermal strain for different heterogeneous constants and temperature-dependency properties are discussed. They show that heterogeneity has a significant impact on the temperature field and thermal strain inside functionally graded cylinders. Moreover, it is observed that heterogeneity has no impact on the direction of heat flux vector inside the body; however, any changes in heterogeneity would change the magnitude of heat flux. The results obtained from the analytical method were compared with those of previous studies and FEM, which showed good agreement.

## کلمات کلیدی:

analytical solution, Temperature distribution, Thermal Strain, Cylinders with Varying Thickness, Temperature-Dependent Properties, Functionally graded Material (FGM), First-Order Temperature Theory (FTT), Perturbation Technique

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