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02

APPLICATION OF THIRD ORDER PLATE THEORY TO THE ANALYTIC SOLUTIONS OF CLAMPED RECTANGULAR THICK PLATE

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ABSTRACT

In this paper, a third-order shear deformation plate theory is applied for flexural analysis of an isotropic rectangular thick plate with all four edges clamped (CCCC) and carrying uniformly distributed lateral load. Total potential energy equation was formulated using static elastic theory, thereafter, the three coupled general governing differential equations for the determination of the out of plane displacement and shear deformations rotation along the direction of x and y coordinates were obtained using the method of direct variation. These equations as obtained are solved simultaneously after minimization to determine the coefficients of displacements of the plate and other the mentioned functions. From the formulated expression, the formula for calculation of the maximum deflection, moment, stress and in-plane displacements were deduced. The proposed method obviates the need of shear correction factors, which is associated with Mindlin's theory (FSDT) for the solution to the problem. Moreover, numerical comparison shows the correctness and accuracy of the results.

Keywords: CCCC plate, Third-order plate theory, Displacement, Bending moment and stress.

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