

## عنوان مقاله:

Analytical Elasticity Solution for Accurate Prediction of Stresses in a Rectangular Plate Bending Analysis Using Exact ۳-D Theory

## محل انتشار:

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## خلاصه مقاله:

The bending attributes of a uniformly-loaded thick plate was modelled with three-dimensional (۳-D) elasticity plate theory using exact polynomial displacement function. Plates with free support at its third edge and simply supported at other edges (SSFS), were covered in this study. The effect of shear deformation along with the transverse normal strain stress was considered in this model obviating the coefficients of shear correction. The total potential energy expression was formulated from ۳-D kinematic and constitutive relations. The slope and deflection relationship was obtained from the equilibrium equation developed from the energy functional transformation. The solution of the equilibrium equation produced an exact polynomial deflection function while the coefficient of deflection of the plate was formed from the governing equation employing a direct variation approach. The formular for computing the displacement-stress components of the plate was established from these solutions in order to evaluate the bending properties of the plate. The solutions realized herein certifies that the ۳D model is exact and consistent compared to refined plate theories applied by previous authors in the available literature. The total average percentage variation of the center deflection values obtained by Onyeka and Okeke, (۲۰۲۰) and Gwarah (۲۰۱۹), is ۳.۲۸%. This showed that at ۹۷% confidence level, ۳D model is most suitable and safe for analyzing the bending characteristics of thick plates unlike the ۲-D RPTs

## کلمات کلیدی:

Exact ۳-D theory, Polynomial shape function, SSFS thick plate, stress prediction, Analytical elasticity solution

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