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Dynamic Analysis of a Moderately Thick Plate on Pasternak Type Foundation under Impact and Moving Loads

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Abstract : In this study, dynamic responses of composite plates on elastic foundations subjected to impact and moving loads are investigated. The first order shear deformation (FSDT) theory is used for moderately thick plates. Pasternak-type (two-parameter) elastic foundation is assumed. Elastic foundation effects are integrated into the governing equations. It is assumed that plate is first hit by a mass as an impact type loading then the mass continues to move on the composite plate as a distributed moving loading, which resembles the aircraft landing on airport pavements. Impact and moving loadings are modeled by a mass-spring-damper system with a wheel. The wheel is assumed to be continuously in contact with the plate after impact. The governing partial differential equations of motion for displacements are converted into the ordinary differential equations in the time domain by using Galerkin’s method. Then, these sets of equations are solved by using the Runge-Kutta method. Several parameters such as vertical and horizontal velocities of the aircraft, volume fractions of the steel rebar in the reinforced concrete layer, and the different touchdown locations of the aircraft tire on the runway are considered in the numerical simulation. The results are compared with those of the ABAQUS, which is a commercial finite element code.

Keywords : elastic foundation, impact, moving load, thick plate
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