

Nonlinear Response of Infinite Beams on a Multilayer Tensionless Extensible Geosynthetic - Reinforced Earth Bed under Moving Load

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Abstract : In this paper analysis of an infinite beam resting on multilayer tensionless extensible geosynthetic reinforced granular fill - poor soil system overlying soft soil strata under moving the load with constant velocity is presented. The beam is subjected to a concentrated load moving with constant velocity. The upper reinforced granular bed is modeled by a rough membrane embedded in Pasternak shear layer overlying a series of compressible nonlinear Winkler springs representing the underlying the very poor soil. The multilayer tensionless extensible geosynthetic layer has been assumed to deform such that at the interface the geosynthetic and the soil have some deformation. Nonlinear behavior of granular fill and the very poor soil has been considered in the analysis by means of hyperbolic constitutive relationships. Governing differential equations of the soil foundation system have been obtained and solved with the help of appropriate boundary conditions. The solution has been obtained by employing finite difference method by means of Gauss-Siedel iterative scheme. Detailed parametric study has been conducted to study the influence of various parameters on the response of soil - foundation system under consideration by means of deflection and bending moment in the beam and tension mobilized in the geosynthetic layer. These parameters include the magnitude of applied load, the velocity of the load, damping, the ultimate resistance of the poor soil and granular fill layer. The range of values of parameters has been considered as per Indian Railways conditions. This study clearly observed that the comparisons of multilayer tensionless extensible geosynthetic reinforcement with poor foundation soil and magnitude of applied load, relative compressibility of granular fill and ultimate resistance of poor soil has significant influence on the response of soil - foundation system. However, for the considered range of velocity, the response has been found to be insensitive towards velocity. The ultimate resistance of granular fill layer has also been found to have no significant influence on the response of the system.

Keywords : infinite beams, multilayer tensionless extensible geosynthetic, granular layer, moving load and nonlinear behavior of poor soil

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