ABSTRACT

Present investigation deals with the study of foundation behaviour subjected to dynamic loading on various layered soil systems. Equivalent lumped parameter model is suggested to study this problem. Further important parameters required to analyse the layered system by equivalent lumped parameter model are identified. Estimation of equivalent stiffness of the layered system found to be one of the important steps in the analysis and a simplified method is developed to estimate it. Equivalent stiffnesses are expressed in equation form in terms of different affecting parameters namely thickness of layers, position of rigid boundary, shear modulus ratios between adjacent layers and radius of the foundation. Different layered system included in the study are (i) stratum over rigid boundary (ii) two layered system (bottom layer being half space) (iii) two layered system underlain by rigid layer (iv) three layered system (bottom layer half space) (v) three layered system underlain by rigid boundary.

Extensive experimental investigation are also carried out on different layered soil system to study the dynamic behaviour of foundation on layered soil system. Model block vibration tests in vertical mode are carried out using Lazan type oscillator. Sand and sawdust are used to prepare different layered systems. Using them in different positions (i) stratum, (ii) two layered system and (iii) three layered system are prepared. Different static weights and eccentricities are used to simulate different foundation weights and dynamic force levels. Frequency versus amplitude curves are obtained for all layered system. It is observed that the dynamic response significantly affected due to presence of layering. Using experimental data from layered soil system, suggested method for estimating equivalent stiffness is also verified and found encouraging agreement between them. Experimental investigation is also carried out on different sizes of surface footings with different static and dynamic loadings to establish the relationship between stiffness and other affecting parameters The correlation between the stiffness and other parameters is established for a particular soil and verified by conducting test on a separate block foundation. This study indicates that the stiffness of prototype foundation can be estimated by model footing vibration tests and establishing such correlation.

Keywords: damping, dynamic response, footing, model, shear modulus, soil layer, stiffness, strain, tests, vibration