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Analysis of a strip footing on a homogenous soil using element free Galerkin method

Aashiq H. Ganaie[a] and Vishwas A. Sawant[*]

Department of Civil Engineering, Indian Institute of Technology Roorkee – 247667, India

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Abstract. Strip footing is an important type of shallow foundations and is commonly used beneath the walls. Analysis of shallow foundation involves the determination of stresses and deformations. Element free Galerkin method, one of the important mesh free methods, is used for the determination of stresses and deformations. Element free Galerkin method is an efficient and accurate method as compared to finite element method. The Element Free Galerkin method uses only a set of nodes and a description of model boundary is required to generate the discrete equation. Strip footing of width 2 m subjected to a loading intensity of 200 kPa is studied. The results obtained are agreeing with the values obtained using analytical solutions available in the literature. Parametric study is done and the effect of modulus of deformation, Poisson's ratio and scaling parameter on deformation and stresses are determined.

Keywords: strip footing; mesh free; element free galerkin method; vertical deformations; stress distribution

1. Introduction

Shallow foundations are one of the important classes of structural foundations. A shallow foundation transmits structural loads to the soil strata at relatively small depths. Terzaghi defined a shallow foundation as the one which is laid at a depth D_f such that D_f is smaller than width of foundation.

The estimation of settlement and stress distribution of shallow foundations is an important topic in the design and construction of buildings and other related structures. In general, settlement of a foundation consists of two major components—elastic settlement (S_e) and consolidation settlement (S_c) (Ranjan and Rao 2011). In turn, the consolidation settlement of a submerged clay layer has two parts; that is, the contribution of primary consolidation settlement (S_p) and that due to secondary consolidation (S_s) (Ranjan and Rao 2011). For a foundation supported by granular soil within the zone of influence of stress distribution, the elastic settlement is the only component that needs consideration.

In the present study element free Galerkin method (EFGM) is used to determine the settlements and stress distribution beneath a strip or continuous footing. Meshfree method is a method used to

∗Corresponding author, Associate Professor, E-mail: sawntfce@iitr.ac.in
[a] M Tech student, E-mail: aashiqganaie1991@gmail.com

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