



Cairo University

# **A DEVELOPED FEM-BEM PRACTICAL TECHNIQUE TO CONSIDER SSI IN THE LATERAL ANALYSIS FOR MULTISTORY BUILDINGS**

By  
**Abdelrahman Mohamed Ibrahim Ali Elmeliegy**

A Thesis Submitted to the  
Faculty of Engineering at Cairo University  
In Partial Fulfillment of the Requirements for the Degree of  
Master of Science  
In  
Structural Engineering

FACULTY OF ENGINEERING, CAIRO UNIVERSITY  
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Under the Supervision of

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FACULTY OF ENGINEERING, CAIRO UNIVERSITY  
GIZA, EGYPT  
2017

## *DEDICATION*

*To whom I would never be without their guidance and support*

*To my mother, father, brother and sisters*

*A.M. Elneliegy*

*Feb. 2017*

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First of all due thanks go to **God** the most merciful and most graceful. Who without his guidance and inspiration nothing could have been accomplished.

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A.M.Elmeligy....February,2017

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**Title of Thesis:**

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**Keywords:**

BEM; Soil-structure interaction; static condensation; foundation-soil flexibility; static soil-structure interaction.

**Summary:**

In this thesis, a new practical technique for the analysis of buildings including soil-structure interaction is suggested. The new analysis is based on sub-structuring approach where the system is partitioned into two main parts which are the superstructure part and the raft-soil part. A static condensation technique is implemented at the column-raft interface. A developed algorithm representing the column-raft interface is implemented to ensure compatibility and equilibrium at that interface. Current practical analysis of SSI is implementing the static condensation at the raft-soil interface which is time consuming and tediously job. The new analysis has shown less time and effort in the modeling and analyses. This technique of analysis is presented here only for linear analysis. However, this technique can be extended to include nonlinear analysis such as no tension SSI, soil nonlinearity SSI.

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