THEORETICAL CONTRIBUTION TO THE STRUCTURAL BEHAVIOR OF RAFT FOUNDATION RESTING ON PILES

BY

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(B.Sc of Civil Engineering)

submitted in partial fulfillment for the requirements of the degree of Master of Science in Civil Engineering (Structural Engineering)

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Approval Sheet

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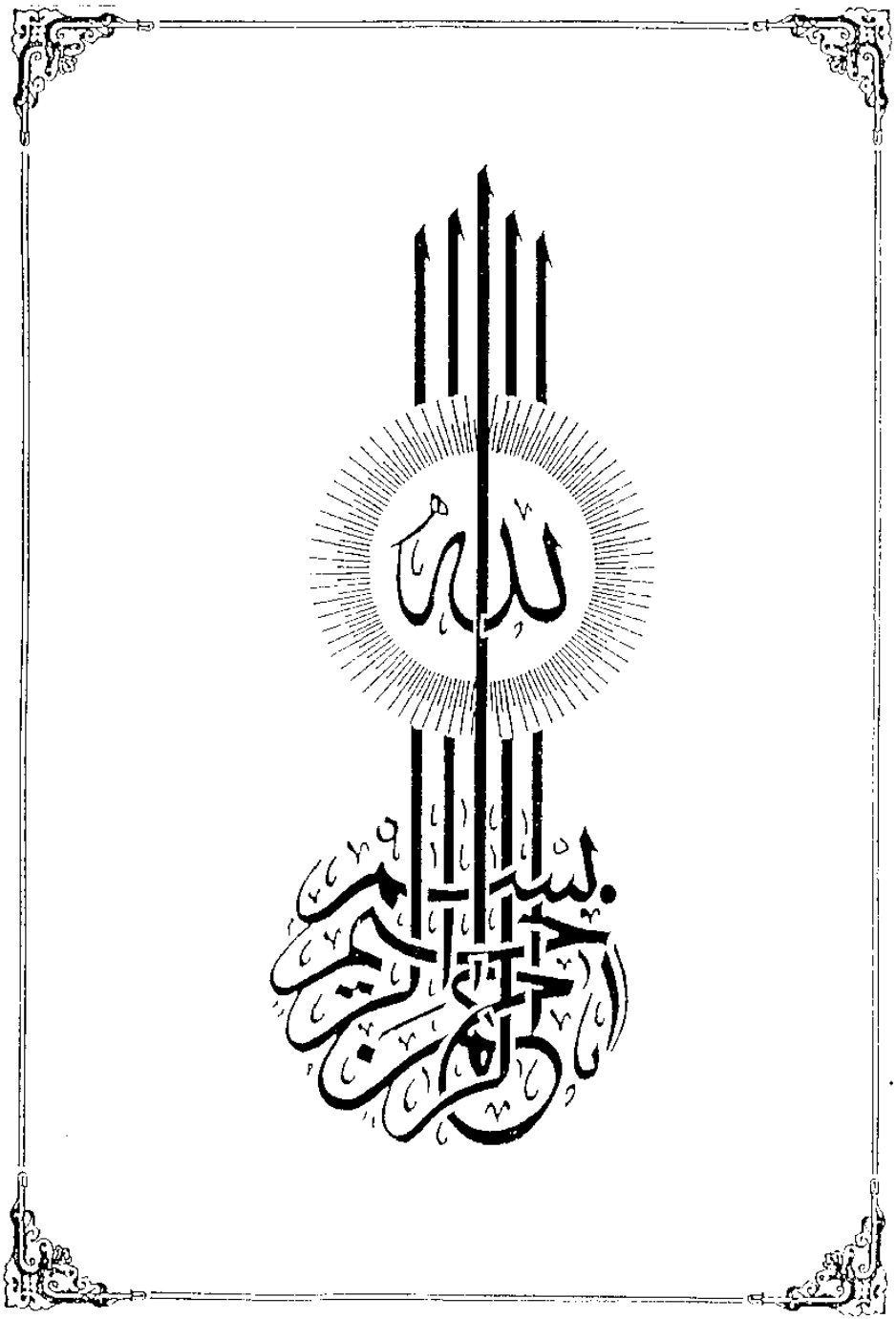

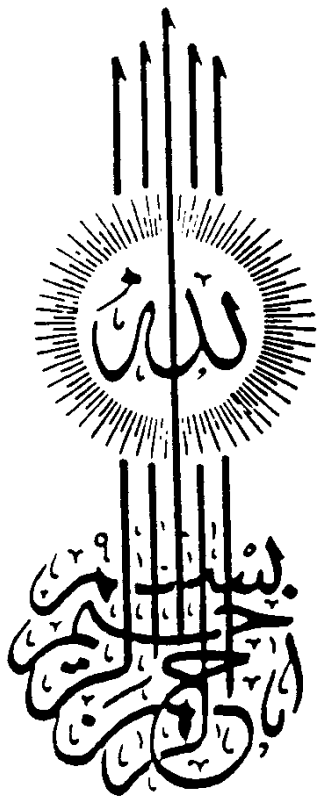

قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا
عَلَّمْتَنَا إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ .

صَدَقَ اللَّهُ الْعَظِيمُ
البقرة - ٣٢ -

To my parents .....

STATEMENT

This dissertation is submitted to Ain Shams University for the degree of **MASTER OF SCIENCE** in Structural Engineering.

The work included in this thesis was carried out by the author in the department of Structural Engineering, Ain Shams University, from December 1990 to September 1993.

No part of this thesis has been submitted for a degree qualification to any other University or institution.

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Theoretical Contribution to the Structural Behavior of Raft Foundation Resting on Piles

(M.Sc. Thesis in Civil Eng., Ain Shams Univ.)

BY

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ABSTRACT

Despite of the extensive research works carried out in the past to determine the behavior of raft foundation, still the raft foundation resting on piles requires further studies. This is to define its actual behavior under the action of various loading systems acting on the superstructure.

In the present research, the soil-structure interaction problem concerning raft foundation resting on piles has been studied. The supporting soil is assumed to be homogeneous, isotropic and purely elastic of half space form. For the sake of the analysis, the soil and piles supporting the raft are substituted by appropriate springs of stiffness selected to yield the best representation of the stiffness of piles and soil. To determine the actual stiffness of each pile, three developed approaches are proposed to represent the interaction between soil and piles

A reinforced concrete tower having 22 stories which was constructed on a raft foundation resting on 729 driven cast-in place concrete piles is used as a case study. During and post the construction phase of this building, the settlement values of the raft were monitored and recorded periodically under 33 different columns locations. Settlement contour maps for these field records are plotted.

Different parameters that affect the pile foundation behavior such as the rigidity of the superstructure, the rigidity of the raft and the soil properties have been examined through the case study. Accordingly, taking their effect into account, the method representing the actual behavior of the system has been established. Applying the proposed approaches on the case study building, Settlement of the building is computed for the same case of loading and erection progress. The results of the various settlement analyses and actual field are compared. Comparison shows that both the two results are very close. Detailed records of loading of the building during different stages of construction were then calculated and the actual load-deformation behavior is established. The actual load per pile is computed and pile load contour maps are developed. Also, deformation behavior is established.

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