AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING

EFFECT OF HORIZONTAL BEAMS AND TIES ON THE BEHAVIOUR OF ELEVATED TANKS USING FINITE ELEMENT TECHNIQUE

BY

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A Thesis
Submitted In Partial Fulfillment Of The Requirements of
The Degree Of Master Of Science In Structural Engineering.

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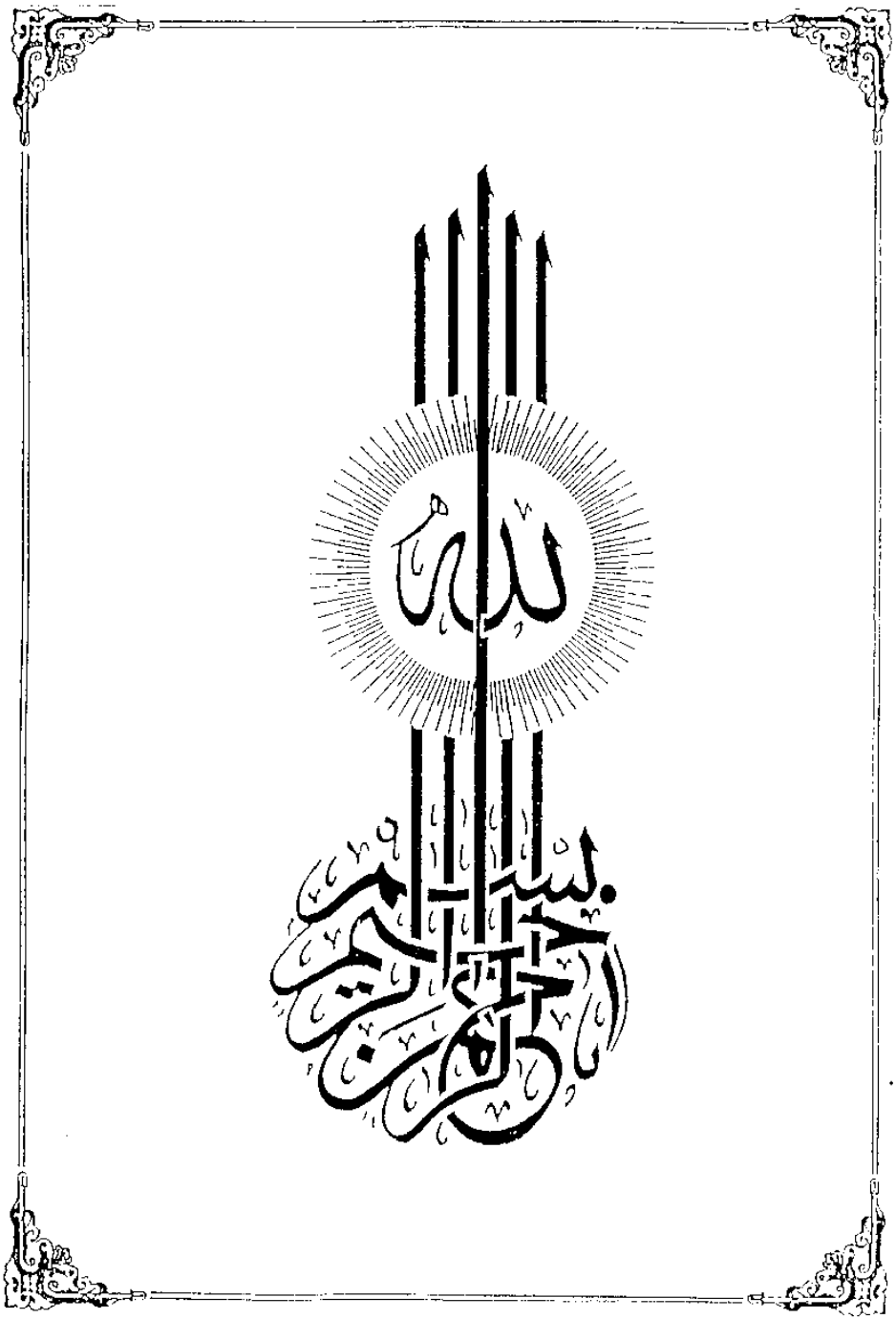
199.

TO MY PARENTS
& MY WIFE



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STATEMENT

This thesis 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 June 1983 to 1992.

No part of this thesis has been submitted for a degree or a qualification at any other University or Institute exept when due reference is made in the text of the thesis.

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SUMMARY

This research is a study of the effect of top horizontal beams and ties on the stresses and internal forces in walls and floor of elevated tanks with variable aspect ratio using finite element technique. It takes into account the actual interactions between walls and floor. A trial is also made to find an approximate method for analysing elevated tanks keeping a reasonable accuracy degree.

The research is composed of six chapters.

CHAPTER ONE:-

This is an introduction and literature review for various existing methods of analysis for solving elevated tanks as follows:-

a- Analytical methods using direct solution of differential equation and energy principles.

b- Numerical methods such as finite difference and finite element techniques.

c- Analogy methods are made by using simple structural finite elements such as plane frame elements or space frame elements having equivalent stiffness of the actual structure.

CHAPTER TWO:-

It explains different finite elements used in the present analysis and the assessment of the accuracy.

it also gives a parametric study for the effect of top horizontal beams present over two or four sides on the internal forces in walls and floor of tanks with variable aspect ratio.

CHAPTER THREE:-

It is a parametric study to find the effect of the ties connecting mid span points of the long top beams. Top horizontal beams may be located over long sides only or over all sides. The tank aspect ratio is variable. Results are compared with the case of open tanks with free top edges. (i.e. without top beams)

CHAPTER FOUR:-

It is a study of the effect of covering the tanks on the internal forces. The same aspect ratios are considered as in chapters two and three again. Comparison is made with the open tank results.

CHAPTER FIVE:-

A trial is made to find an approximate and simple method for analysing the tank. Grillage elements are used to represent the bending stiffness of the plates (walls and floor) while the inplane stiffness of the plates is represented by plane stress plate elements. The object of this method is to minimize the computing time and capacity.

CHAPTER SIX:-

It gives the conclusions of the research results and their importance to the designer. It also gives the recommendations and suggestions for future works.

Acknowledgement

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