Ain Shams University
Faculty of Engineering
Department of Civil Engineering

INTERACTION OF PLANE FRAMES WITH ELASTIC FOUNDATION

BY

KHALED SAAD EL DIN MOHAMED RAGAB

B.Sc. Civil Eng. 1984
Diploma in Structural Eng. 1990
Ain Shams University

THESIS

SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF

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IN
STRUCTURAL ENGINEERING

SUPERVISED BY

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Professor of Theory of Structures
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Dr. ABDEL SALAM A. MOKHTAR
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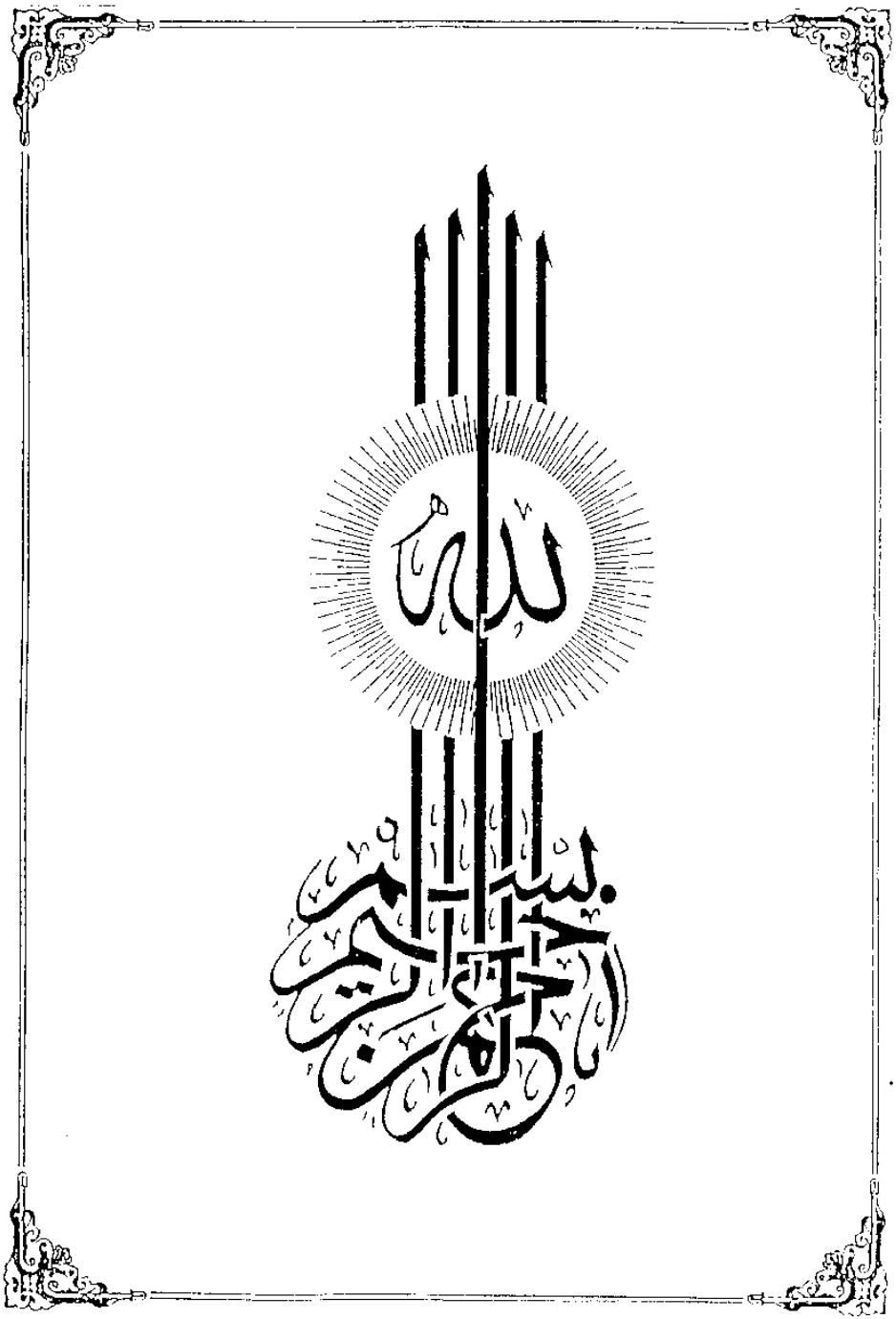

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Date 4/ 7/ 1993

STATEMENT

This dissertation is submitted to Ain Shams University for the Degree of M.SC. in Civil Engineering.

The work included in this thesis was carried out by the author in the Department Of Civil Engineering,Ain Shams University.

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

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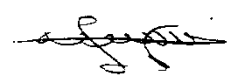
Signature : 

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ACKNOWLEDGEMENT

I would like to express my sincere appreciation to Prof. Dr. Ahmed A. Korashy Professor of theory of structures, department of civil engineering, Ain Shams University for his valuable supervision, suggestions, and helpful comments during the preparation of this thesis.

My deepest appreciation to Dr. Abdelsalam A. Mokhtar, Assistant Professor, department of civil engineering, Ain Shams University for his valuable supervision, discussions, and unfailing attention through all stages of preparation of this thesis.

The another further wishes to acknowledge the fruitful cooperation of the department of systems of research and studies organization, Ministry of development.

Special thanks my family for their valuable advice and continuous encouragement throughout the course of this thesis.

Interaction of Plane Frames with Elastic Foundation

M.Sc. Thesis in Civil Engineering

Dept. of Structural Eng., Ain Shams University

By

Khaled Saad El Din Mohamed Ragab

Abstract

Analysis of statically indeterminate frames are influenced by the deformation of supporting foundation. This thesis presents an analytical procedure which can perform the following tasks.

1- Analysis of interaction of plane frames with elastic foundation having normal and shear moduli of subgrade reactions taking into consideration the nonlinearity of soil, axial flexural interactions of frame and the effect of presence of basement walls and varition of its heights on the internal forces of structure.

2- Study of the effect of framing action when the frame and soil are treated as one compatible unit and comparing this solution with the solution of the foundation alone as a beam on elastic foundation.

3- Study the effect of use of tie beams and varying their positions on the internal forces of structure.

A computer program is developed to analyze these tasks using Fortran 77. Three groups of the models are solved to show the capabilities of the program. In addition, the solution by elastic shear modulus of soil on the internal forces of structure is studied. Based on the results of these groups, the conclusions and recommendations are presented.

TO ....

MY FAMILY

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Notations

The following symbols have been adopted for use in this study other symbols not listed below are defined where they are used.

W	Surface displacement.
K	Modulus of subgrade reaction.
P	Force applied at a point.
E_s	Young's modulus.
γ_s	Poisson's ratio.
EHS	Elastic half space (a semi-infinite continuous elastic solid).
FEM	Finite element methods.
K_v	Vertical subgrade reaction.
K_h	Horizontal soil reaction.
B, L	Width and length of foundation respectively.
D	Depth of embedment.
u	Horizontal displacement.
V	Vertical displacement.
θ	Rotation.
{P} ,{S}	The external force and displacement vectors, respectively.
[K]	The total stiffness matrix.
EI	Flexural rigidity.
q	Represents the transverse distributed load per unit length.
y_o, θ_o	Initial condition for deflection and rotation, respectively.
M_o, Q_o	Initial condition for moment and shear, respectively.
σ_x	Stress

ε_x	Strain
A	Cross section area.
y_p, y_m, y_q	Particular solutions corresponding to concentrated force "P", concentrated moment "M" and uniformly distributed load "q".
V_i^P, V_i^M, V_i^q	Denote the nodal load vector components in the degree of freedom direction (i = 2, 3, 5, 6) due to concentrated "P", concentrated "M" and uniformly distributed load "q" respectively.
δ_A	Deflection of point (A).
γ	The member axes are rotated from the structural axes about the Z axis through the angle γ.
R_T	The rotation transformation matrix for a plane frame member,
C_x, C_y	The direction cosines and sines for the member.