AIN SHAMS UNIVERSITY

FACULTY OF ENGINEERING

"NONLINEAR BEHAVIOUR OF REINFORCED CONCRETE STRUCTURES UNDER EFFECT OF EARTHQUAKES"

By

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بسم الله الرحمن الرحيم

" و ما أوتيتم من العلم الا قليلا "

صدق الله العظيم

بسم الله الرحمن الرحيم

APPROVAL SHEET

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STATEMENT

THIS THESIS IS SUBMITTED TO AIN SHAMS UNIVERSITY FOR THE DEGREE OF MASTER OF SCIENCE IN THE STRUCTURAL ENGINEERING. NO PART OF THIS THESIS HAS BEEN PREVIOUSLY SUBMITTED FOR A DEGREE OR QUALIFICATION.

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Dedication

To The Sole of my MOTHER

&

To Prof. Dr. Shaker El-Behairy

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Finally, the author dedicates this thesis to the sole of his mother, wishing mercy to her, and his father for his continuous encouragement.

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Abstract for The M. Sc. Thesis Submitted by
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Title of The Thesis: **NONLINEAR BEHAVIOUR OF REINFORCED CONCRETE STRUCTURES UNDER EFFECT OF EARTHQUAKES**

ABSTRACT

A non-linear constitutive model for cyclic biaxial loading of reinforced concrete is presented, in which the material properties of concrete and reinforcing bars are modelled. The individual models are combined to form a composite material that is used in conjunction with the finite element technique to predict the response of reinforced concrete structures under earthquake loading.

The proposed model is incorporated in a computer program that is used to analyze plane reinforced concrete structures on a micro-computer. This program is capable of performing the non-linear analysis using a combination of the modified Newton-Raphson method with the Aitken accelerator and the simple linear interpolation.

Then, the proposed computer program has been verified by comparing its results, for some chosen problems, with the experimental results. The program showed a good accuracy and a wide range of applicability.

Finally, a complete study is presented to examine the main parameters affecting the response of reinforced concrete columns and beam-column joints under the effect of earthquake loading. The lateral steel configuration, the amount of lateral steel, and the level of the axial load are discussed to examine their effect on the response of reinforced concrete columns. On the other hand, the effect of spacing between stirrups, column width, ratio of tension to compression reinforcement, percentage of top reinforcement on the response of beam-column joints is also studied.

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