AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
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Pushover Analysis for Reinforced Concrete Building

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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STATEMENT

This thesis is submitted to Ain Shams University, Cairo, Egypt, in partial fulfillment of the requirements for the degree of Master of Science in Structural Engineering.

The work included in this thesis was carried out by the author, and no part of this thesis has been submitted for a degree or a qualification at any other university or institute.

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DEDICATION

To My Dad, My Mam, My Brothers, My Sisters& My Friends

My family that has a great effect on my life,

All my love to them for their care and support

Pushover Analysis for Reinforced Concrete Building
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ABSTRACT

Inelastic static pushover analysis of structural systems subjected to earthquake loading is rapidly gaining ground as a tool for design and assessment. Whereas the potential of such methods is recognized, especially with force-based elastic analysis, there have been concerns over their reliability in predicting correctly the inelastic seismic demands. Push-over analysis is a simple method for the nonlinear static analysis of building structures subjected to monotonically increasing horizontal loading.

In the classical analysis methods of plane framed structures, the axial and flexural rigidities are assumed to be constants. Such ideal conditions are unrealistic because the material behavior is actually nonlinear. The axial and flexural rigidities decrease with the increasing internal forces. The structure geometry is continuously changing with the varying applied forces too. A step-by-step nonlinear analysis method to invest up to failure is essential.

This study provides a new methodology and a computer program in Java language to analyze reinforced concrete structures till failure and takes into consideration both geometric and material nonlinearities. The analysis uses the stiffness method as well as the finite element principles and analyses also the reinforced concrete cross section to calculate the member axial and flexural rigidities. The coordinates are updated each iteration and the axial load effect is considered in the geometrical stiffness matrix and also determines the failure criteria during the analysis. The development of plastic hinges throughout the building can be observed. The nonlinear equations are solved by the Newton Raphson method.

A computer program (POA) is specially developed to solve different types of plane frames. It consists of the main and four classes, which in turns is divided to several methods. The program is simple efficient and robust.