# بسم الله الرحمن الرحيم


MONA MAGHRABY


# شبكة المعلومات الجامعية

# التوثيق الالكتروني والميكروفيلم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

# جامعة عين شمس

# التوثيق الإلكتروني والميكروفيلم

# قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

# يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

***MONA MAGHRABY***


# NUMERICAL MODELLING AND SYSTEM IDENTIFICATION OF A HISTORIC MASONRY STRUCTURE IN HISTORIC CAIRO USING DYNAMIC INVESTIGATION TESTS

By

**Ahmad Reda Abd-Elslam**

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
**MASTER OF SCIENCE**
**in**
**Structural Engineering**

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Under the Supervision of

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FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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**Title of Thesis:**

Numerical modelling and system identification of a historic masonry structure in Historic Cairo using dynamic investigation tests


**Key Words:**
Dynamic identification; Numerical modelling; System identification; Model updating; Neural networks


**Summary:**


Historic Cairo is a UNESCO World Heritage Site since 1979. It has a large number (more than 600) of historic structures. This in turn requires much studies and research to conserve these structures for their cultural, religious and economic values. This thesis studies the dynamic behavior of Fatima Khatun, a historic mausoleum in Historic Cairo dating back to the 13th c. and constructed from brick and stone masonries. A preliminary finite element model was created employing a detailed architectural documentation, material survey and visual inspection. The brick and stone physical and mechanical properties were estimated based on in-situ sampling and laboratory tests. Dynamic identification tests were carried out and followed by system identification to characterize the dynamic properties of the structure (natural frequencies, mode shapes and damping ratios). Numerical model updating was carried out to match the obtained experimental dynamic properties. The obtained updated model could be employed in further studies for the structural safety assessment.

# Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

Name: Ahmad Reda Abd-Elslam Date: / 6 / 2021

Signature:

# Dedication

To my beloved mother.