

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



# شبكة المعلومات الجامعية

## التوثيق الالكتروني والميكرو فيلم



شبكة المعلومات الجامعية

# جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

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# **BEHAVIOR OF CONCRETE BEAMS REINFORCED WITH FRP COMPOSITE BARS**

By

**Saied Abd-El Hy Ghoneim**  
*B.Sc. of Civil Engineering 1987-M.T.C*

**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  
CIVIL ENGINEERING ( STRUCTURAL ENG. )**

**FACULTY OF ENGINEERING  
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**Approved by the  
Examining Committee**

**Dr. Akram M.A. Torkey, Advisor**

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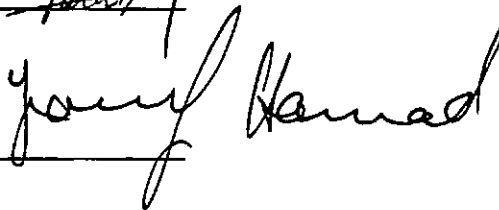
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## ABSTRACT

The use of fiber reinforced polymers (FRP) in place of steel in reinforced concrete members has recently received a great attention in the civil engineering applications. However, the special properties of these materials such as their relatively low modulus of elasticity and their bond characteristics, result in different flexural behavior when compared to steel-reinforced concrete beams. The difference in behavior includes deflection, cracking, ultimate capacity and shear strength. In an attempt to provide insight into the response of FRP reinforced concrete beams, a parametric non-linear finite element study is carried out in this research. The results of the theoretical analysis are compared to those available from a comprehensive experimental program conducted by the first supervisor of this thesis. The theoretical results are also compared to the experimental results available in the literature. In the analytical study the nature of cracking in FRP reinforced concrete beams was taken into consideration in modeling the tension stiffening of such beams. Based on the experimental and the analytical results, design methods are proposed for estimating deflection, flexural capacity, and shear strength of concrete beams reinforced with FRP bars. The proposed methods could be very useful in establishing design guidelines and future code for such beams.

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