MODELLING AND STRENGTH ASSESSMENT OF CONCRETE MADE WITH FINE SAND MINED IN LAGOS STATE

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BY

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A DISSERTATION SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF ENGINEERING (M.ENG) IN CIVIL ENGINEERING (STRUCTURES AND MATERIALS OPTION), COLLEGE OF ENGINEERING, COVENANT UNIVERSITY, OTA, OGUN STATE, NIGERIA

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ACCEPTANCE

This is to attest that this dissertation has been accepted in partial fulfillment of the requirements for the award of Masters of Engineering (M.Eng) in Civil Engineering (Structures and Materials) in the Department of Civil Engineering, College of Engineering, Covenant University, Ota, Ogun State, Nigeria.

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Prof. Akan B. Williams
(Dean, School of Postgraduate Studies) **Signature and Date**

DECLARATION

I, MICHAELS TEMITOPE OLUWADAMILARE AUGUSTINE (17PCI02074), declare that this research was carried out by me under the supervision of Prof. Olatokunbo M. Ofuyatan of the Department of Civil Engineering, Covenant University, Ota, Ogun State. I attest that the dissertation has not been presented either wholly or partially for the award of any degree elsewhere. All sources of data and scholarly information used in this dissertation are duly acknowledged.

MICHAELS, TEMITOPE OLUWADAMILARE AUGUSTINE

Signature and Date

CERTIFICATION

This is to certify that this research was carried out by **MICHAELS, TEMITOPE OLUWADAMILARE AUGUSTINE (17PCI02074),** and the research has been read and approved as meeting the requirements of the Department of Civil Engineering, College of Engineering, Covenant University, Ota, Ogun State, for the award of Master of Engineering.

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DEDICATION

I dedicate the entirety of this project to God who blessed me with life and mental capacity to execute this project.

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LIST OF ABBREVIATIONS

CDW - Construction and Demolition

CaO - Calcium Aluminate Hydrate

FRA - Fine Recycled Aggregates

FNA - Fine Regular Totals

PSD - Particle Size Distribution

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

ABSTRACT

The utilization of locally sourced materials in concrete production is pivotal for sustainable construction practices, particularly in regions with abundant natural resources. This research proposal aims to assess the strength properties of concrete produced using fine sand mined in different locations in Lagos State. The physical and chemical properties, as well as the grading characteristics, of sand samples from Bariga, Badagry, Epe, and Ikorodu were determined using standard procedures. Additionally, concrete samples were produced using aggregates from these selected locations. The concrete cubes were cured in water for periods ranging from 7 to 56 days. The constituents were modeled using Fuzzy logic, and the experimental values were compared with analytical models (linear, and polynomial), and Fuzzy logic model (Artificial Intelligence). The modeling predicted the compressive strength with a very high degree of accuracy. The results indicated that all the sand samples contained high levels of silica. Furthermore, the fine aggregates had pH values between 7.01 and 7.41, chloride contents ranging from 0.002% to 0.028%, and sulphate contents between 0.0025% and 0.0039%. The compressive strength of concrete made with all the fine sands exceeded 25 N/mm² at 28 days of curing. It was observed that fine aggregates from Bariga gained strength more slowly in the early days compared to those from the other locations. These findings provide valuable insights into the different types of locally available sand materials, thereby promoting sustainable and cost-effective construction practices in Lagos State and similar regions. Ultimately, this research contributes to the development of guidelines for the effective use of fine sand in concrete production, ensuring both structural durability and environmental sustainability. Some improvement would be required during the use of some fine aggregate with impurities to cast concrete. Given the significant role of sand quality in determining the structural integrity of concrete, this study seeks to provide a comprehensive evaluation of the mechanical performance of concrete incorporating these mined fine sands.

Keywords: Sand, Fuzzic Logic, Modelling, Strength, Lagos State, Regression Analysis