

**FIXED POINT RESULTS INVOLVING FUZZY η -TYPE
MAPPINGS WITH APPLICATIONS**

Solomon Zerfu Degefa, Vizender Singh* and Yohannes Gebru Aemro

Department of Mathematics,
Wolkite University, Wolkite, ETHIOPIA

E-mail : sol.zerfu@gmail.com, yohannes.gebru@wku.edu.et

*Department of Mathematics,
Guru Jambheshar University of Science and Technology,
Hisar - 125001, Haryana, INDIA

E-mail : vsihag3@gmail.com

(Received: Jul. 11, 2025 Accepted: Aug. 09, 2026 Published: Aug. 30, 2026)

Abstract: In this article, we introduce the notions of fuzzy η -contraction and fuzzy η -Suzuki contraction mappings and utilize them to establish fixed point theorems within the broader framework of the Banach contraction principle. These results extend and generalize existing fixed point theorems in the literature. Several corollaries are derived to reinforce the main theorems. Finally, the theoretical findings are applied to demonstrate the existence and uniqueness of solutions for a second-order nonlinear boundary value problem.

Keywords and Phrases: Fixed point, Contraction mapping, Fuzzy η -contraction, Fuzzy η -Suzuki contraction, Boundary value problem.

2020 Mathematics Subject Classification: Primary: 46T99; Secondary: 47H10, 45D05, 54H25.

1. Introduction

The concept of a metric space was introduced in 1906 by the French mathematician Fréchet [8] and further developed by Hausdorff. Metric fixed point theory is a very well known branch of fixed point theory studying the existence and uniqueness