Fuzzy BCK-algebras and its Fuzzy Left (Right) Reduced Ideals

PENG Jia-yin
(School of Mathematics and Information Science, Neijiang Normal University, Neijiang 641199, China)

Abstract Introducing the concepts of fuzzy spaces and fuzzy binary operations proposed by Dib into BCK-algebra, a new approach to study fuzzy BCK-algebra was given. The concepts of fuzzy subalgebras, fuzzy left (right) reduced ideals and fuzzy homomorphisms of fuzzy BCK-algebras were put forward. A new theory of fuzzy BCK algebra was preliminarily established. The results show that the classical fuzzy subalgebra and fuzzy left (right) reduced ideal of BCK-algebra are the special cases of the new theory, so the new method provides a powerful tool to develop the theory of fuzzy BCK-algebras.

Keywords Fuzzy space, Fuzzy binary operation, Fuzzy BCK-algebra, Fuzzy left (right) reduced ideal, Fuzzy homomorphism.

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Zadeh[1], Rosenfeld[2], Negoița[3], Ralescu[4], Rosenfeld[5], Anthony[6], Sherwood[7], Kuroki[8], Liu[9], Nanda[10], Heyting[11], Dib[12], Liu[13], Rosenfeld[14], Xie[15].

1. Introduction

BCK-algebras were introduced by Ahti [16] and T. Takagi [17] in 1966. Since then, many people have studied fuzzy BCK-algebras and fuzzy ideals, and made some interesting results [18].

In this paper, we introduce fuzzy BCK-algebras and fuzzy ideals, and present new results on the related concepts. The main new result presented here is the introduction of fuzzy left and right reduced ideals in BCK-algebras.

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设定义一个函数

\[ (x, y) \rightarrow f_{x,y}(r, s) = rf_{x,0} + sf_{y,0}. \]

\[ A \times B = \bigvee_{x, y \in A} \bigvee_{r, s \in B} f_{x,y}(r, s). \]

\[ A_{FB} = \bigvee_{x \in X} \bigvee_{y \in Y} (x, A(x))B(y). \]

\[ C = \bigvee_{x \in X} \bigvee_{y \in Y} x \times y. \]

\[ D = \bigvee_{x \in X} \bigvee_{y \in Y} x \times y. \]

\[ E = \bigvee_{x \in X} \bigvee_{y \in Y} x \times y. \]

\[ F = \bigvee_{x \in X} \bigvee_{y \in Y} x \times y. \]

\[ G = \bigvee_{x \in X} \bigvee_{y \in Y} x \times y. \]

\[ H = \bigvee_{x \in X} \bigvee_{y \in Y} x \times y. \]

\[ I = \bigvee_{x \in X} \bigvee_{y \in Y} x \times y. \]

\[ J = \bigvee_{x \in X} \bigvee_{y \in Y} x \times y. \]

\[ K = \bigvee_{x \in X} \bigvee_{y \in Y} x \times y. \]

\[ L = \bigvee_{x \in X} \bigvee_{y \in Y} x \times y. \]

\[ M = \bigvee_{x \in X} \bigvee_{y \in Y} x \times y. \]

\[ N = \bigvee_{x \in X} \bigvee_{y \in Y} x \times y. \]

\[ O = \bigvee_{x \in X} \bigvee_{y \in Y} x \times y. \]

\[ P = \bigvee_{x \in X} \bigvee_{y \in Y} x \times y. \]

\[ Q = \bigvee_{x \in X} \bigvee_{y \in Y} x \times y. \]

\[ R = \bigvee_{x \in X} \bigvee_{y \in Y} x \times y. \]

\[ S = \bigvee_{x \in X} \bigvee_{y \in Y} x \times y. \]

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\[ U = \bigvee_{x \in X} \bigvee_{y \in Y} x \times y. \]

\[ V = \bigvee_{x \in X} \bigvee_{y \in Y} x \times y. \]

\[ W = \bigvee_{x \in X} \bigvee_{y \in Y} x \times y. \]

\[ X = \bigvee_{x \in X} \bigvee_{y \in Y} x \times y. \]

\[ Y = \bigvee_{x \in X} \bigvee_{y \in Y} x \times y. \]

\[ Z = \bigvee_{x \in X} \bigvee_{y \in Y} x \times y. \]
(2) \( f_{x,y} \in U \cap I \). \( U \) 为模糊代数 \( (x, I, F, (0, I)) \) 的模糊代数。对所有 \( x \in U \), 有

* 1. \( U \) 为模糊代数 \( (X, F, (0, I)) \) 的模糊代数。

\[ F(x, y) = \min \{ f_{x,y}, F(x, F(x, y)) \} \]

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$(\forall I \in \mathbb{R}) (f(r, s) = r \land s \in (X, F)) \iff \exists G = (F, \gamma),$

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