JOURNAL OF ALGEBRAIC STATISTICS
Volume 13, No. 2, 2022, p. 140-144
https://publishoa.com
ISSN: 1309-3452

Doubt Anti Fuzzy Km Ideal On K- Algebras

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Abstract
Anti fuzzy KM ideal on K-algebras and doubt anti fuzzy KM ideal on K-algebras are introduced and some of their basic properties are discussed in this paper. The results of anti fuzzy KM ideal on K-algebras and doubt anti fuzzy KM ideals on K-algebra are analysed.

Keywords: K-algebras, KM ideal, fuzzy KM ideal, anti fuzzy KM ideal on K-algebras, doubt anti fuzzy KM ideal.

1. INTRODUCTION

Fuzzy logic is used in numeric fields such as control systems engineering, image processing, power engineering, industrial automation, robotics, consumer electronics, optimization etc.

The K-algebra (G,., e) on anabelian group (G, .) is same as the BCI-algebra (G,., e) and isproved in [1]. Properties, homomorphic image and inverse image on fuzzy ideals of K-Algebras are discussed in [2]. Fuzzy KM ideal on K-Algebra is introduced and its properties are studied in [3]. Discussion of soft set to K-Algebras and abelian soft K-Algebras are in [4]. Doubt fuzzy sub algebra, implicative and prime of doubt fuzzy ideal in BCK/BCI are defined and their properties are discussed in [5]. Introduction of doubt fuzzy BF algebra and their basic properties are studied in [6]. Doubt fuzzy KM ideals on K-Algebra is defined and their properties are tested in [7]. In this paper, doubt anti fuzzy KM ideals on K=Algebra is introduced and its few properties are tested.

2. PRELIMINARIES

Definition 2.1. If $\eta(a\odot b) \geq \min\{\eta(a), \eta(b)\}$ then a fuzzy set η in a K-algebra is named as fuzzy sub algebra of K.

Definition 2.2. A fuzzy set η of a K-Algebra A iscalled a Doubt Fuzzy Subalgebra of A if
$\eta(a\odot b) \leq \max\{\eta(a), \eta(b)\}\ \forall\, a,b \in A$.

Definition 2.3. If $\eta(a\odot b) \leq \max\{\eta(a), \eta(b)\}$ then a fuzzy set η in a K-algebra is named as anti fuzzy sub algebra of K.

Definition 2.4. A fuzzy set η of a K-Algebra A iscalled a Doubt Anti Fuzzy Subalgebra of A if η (a⊙b)≥ min { η (a),η (b)} ∀ a, b ∈ A.

Definition 2.5. Letηbe a fuzzy set of K-Algebras Afor t ∈ [0, 1], then the sets
η_t = {a∈ A/ η (a) ≥ t), η_t = {a ∈ A/ η (a) ≤ t), can be empty. The set $\eta_t = \emptyset$ (respt. $\eta^t \neq \emptyset$) is called the t (resptt-doubt) confidence set of η.

Definition 2.6. A fuzzy set ηof K algebra Ais called a Doubt Fuzzy(DF) ideal of Aif
(1) η (e) ≤ η (a) ∀ a ∈ G.
(2) η (b) ≤ max {η (b⊙a), η (a⊙(a⊙b))}, ∀ a, b ∈ G.

Definition 2.7. A fuzzy set ηof K algebra Ais called a Doubt Anti Fuzzy(DAF) ideal of Aif
(1) η (e) ≥ η (a) ∀ a ∈ G.
(2) η (b) ≥ min {η (b⊙a), η (a⊙(a⊙b))}, ∀ a, b ∈ G.

Theorem 2.1. ηis a anti fuzzy subalgebra of K-Algebra Aiffη_t is empty or sub algebra of Afor all t∈ [0,1].
Proof. Suppose ηis an anti fuzzysubalgebra of A.
Thereforeη (a⊙b) ≤ max {η (a),η (b)} → (2.1)
To prove that η_t is a sub algebra of A.
Let a, b ∈ η_t ⟹ η (a), η (b) ≥ t.
Now η (a⊙b) ≤ max {t, t} from (2.1)
= t
i.e. a⊙b ∈ η_t
Conversely, assume that η_t is a subalgebra of A.
To proveη is a anti fuzzy subalgebra of A.
Let a, b ∈η.
Then η (a) = t and η (b) = s where t ≤ s.
This implies a, b ∈ η_t
⟹ (a⊙b) ∈ η_t (η_t is a sub algebra of A)
⟹η (a⊙b) ≤ t = max {η (a),η (b)}
Hence η is a anti fuzzy subalgebra of A.

Theorem 2.2. η is a anti fuzzy KM ideal of K-Algebra A iffη_t is KM ideal of A, t ∈ [0,1].
Proof. Suppose η is a anti fuzzy ideal of A.
Here η_t = {b∈ B/ η (b) ≥ t),
η (0) ≥ t ⟹0 ∈ η_t
Let a⊙b , a⊙(a⊙b), b ∈ η_t
η (b) ≤ max {η (b⊙a), η (a⊙(a⊙b))} ≤ max {t, t}
⟹b ∈ η_t
Therefore a⊙b, b ∈ η_t ⟹a ∈ η_t
⟹ η_t is a KM ideal of K-Algebra.
Conversely assume that η_t is a KM ideal.
To prove η is a anti fuzzy KM ideal.
Let a, b ∈ A such that
η (a⊙b) = t and η (a⊙(a⊙b)) = s where t ≤ s.
Then a⊙b, b ∈ η_t.
Therefore a ∈ η_t, since η_t is a KM ideal.
⟹ η_t≤ t max {t, s}

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= max {η (a⊙b), η (a⊙(a⊙b))}
Hence η is a anti fuzzy KM ideal of A.

Theorem 2.3. A fuzzy subsetη of K-Algebra A is a anti fuzzy KM ideal of A iff its complements η^c is DAF KM ideal of A.
Proof.Let η be a anti fuzzy ideal of A.
To prove η^c is DAF KM ideal.
Let a, b ∈ A, $\eta^c(0) = 1 - \eta$ (0)
$\leq 1 - \eta$ (a)
$= \eta^c(a)$
i.e. $\eta^c(0) \leq \eta^c(a)$
Now η (0)≥ η (a)∀ a ∈ A.
$\Rightarrow \eta^c(a) = 1 - \eta$ (a)
$\geq 1 -$ max {η (b⊙a), η (a⊙(a⊙b))}
$\geq 1 -$ max { $1 - \eta^c$ (b⊙a), $1 - \eta^c$ (b⊙(b⊙a))}
≥ min { η^c (b⊙a), η^c (b⊙(a⊙b))}
$\Rightarrow \eta^c$ is a doubt anti fuzzy KM ideal of A.
Conversely let η^c is a doubt anti fuzzy KM ideal of A.
To prove η is a anti fuzzy KM ideal of A.
$\eta^c(0) \geq \eta^c(a)\eta^c(a)$
≥ min { η^c (b⊙a), η^c (b⊙(a⊙b))}
(i) $\Rightarrow 1 - \eta$ (0)≥$1 - \eta$ (a)
$\Rightarrow \eta$ (0) $\leq \eta$ (a)
(ii) $\Rightarrow 1 - \eta$ (a)≥ min {$1 - \eta^c$ (b⊙a), $1 - \eta^c$ (b⊙(a⊙b))}
$\geq 1 -$ max { η^c (b⊙a), η^c (b⊙(a⊙b))} - η (a)
$\geq -$ max {η (b⊙a), η (b⊙(a⊙b))} - η (a)
$\leq$ max {η (b⊙a), η (b⊙(a⊙b))}
⟹η is a anti fuzzy KM ideal

Theorem 2.4. Let η be a fuzzy subset of a K algebra A. If η is a doubt anti fuzzy KM ideal of A, then the lower level cut η_t is a KM ideal of A for all t∈ [0,1], t ≥ η (0).

Proof. Let η be a doubt anti fuzzy KM ideal of A.

Therefore, we have η(0) ≥ η (a) and

η (b) ≥ min {η (b⊙a), η (a⊙(a⊙b))}
To prove$\eta_t$is an ideal of A.

η_t = {a∈ A / η (a) ≥ t }

Let a, b∈η_t

Since η(0) ≥ η (a) ≥ t ⇒ 0 ∈η_t, ∀ t∈ [0,1]

Let a ⊙b, a⊙ (a⊙b) ∈η_t

Therefore η (a⊙b) ≥ t,η (a⊙(a⊙b)) ≥ t

η (b) ≥ min { η (b⊙a), η (a⊙(a⊙b))}
≥ min {t, t}
= t

Hence η (a) ≥ t ⇒ a $\in \eta_t$

a$\odot b$, b $\in \eta_t \Rightarrow$ a $\in \eta_t$

Therefore η_t is a KM ideal of A.

Theorem 2.5. Let η_1 and $\eta_2$be two doubt anti fuzzy KM ideal of K algebra A. Then $\eta_1 \cup \eta_2$ is also a doubt anti fuzzy KM ideal of A.

Proof. Let a, b∈ A.

Therefore $(\eta_1 \cup \eta_2)$ (0) = min $\{\eta_1(0), \eta_2(0)\}$
$\geq \min\{\eta_1(x), \eta_2(x)\}$
$= (\eta_1 \cup \eta_2)(x)$

Therefore $(\eta_1 \cup \eta_2)(0) \geq (\eta_1 \cup \eta_2)(x)$
Now $(\eta_1 \cup \eta_2)(x) = \min\{\eta_1(x), \eta_2(x)\}$
$\geq \min\{\min\{\eta_1(b \odot a), \eta_1(a \odot (a \odot b))\}, \min\{\eta_2(b \odot a), \eta_2(a \odot (a \odot b))\}$
$\geq \min\{\min\{\eta_1(b \odot a), \eta_2(b \odot a)\}, \min\{\eta_1(a \odot (a \odot b), \eta_2(a \odot (a \odot b))\}\}$
$= \min\{(\eta_1 \cup \eta_2)(b \odot a), (\eta_1 \cup \eta_2)(a \odot (a \odot b))\}$
Therefore $(\eta_1 \cup \eta_2)$ is a doubtanti fuzzy KM ideal of A

Theorem 2.6. If η is a doubt anti fuzzy (DAF) KM ideal of a K-algebra A, then the set
$A_\eta = \{a \in A / \eta(b) = \eta(0)\}$ is an ideal of A

Proof. Clearly $0 \in A_\eta$
Let b $\odot$ a, $b \in A_\eta \Longrightarrow \eta(b \odot a) = \eta(b) = \eta(0)$, sinceη is a DAF KM ideal
$\eta(b) \geq \min\{\eta(b \odot a), \eta(a \odot (a \odot b))\}$
$= \min\{\eta(0), \eta(0)\} = \eta(0)$
Therefore, since η is a DAF KM ideal,
$\eta(b) \geq \eta(0)$
Also $\eta(0) \geq \eta(b) \Longrightarrow \eta(b) = \eta(0)$
If $b \in A_\eta$ then b $\odot$ a, $b \in A_\eta \Longrightarrow b \in A_\eta$
$\Longrightarrow A_\eta$is an ideal

CONCLUSION

Doubt anti fuzzy KM ideal on K-Algebras is introduced and studied in this paper. Doubt anti fuzzy KM ideal on K-Algebras is verified with some of their properties. This paper will be useful in real time application.

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