INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH & DEVELOPMENT

ISSN 2278 – 0211 (Online)

Fuzzy Soft Hyper K-ideal of a Hyper K-algebra

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Abstract:
Fuzzy soft hyper K-ideals of a hyper K-algebra are introduced and related properties are discussed. Relation between fuzzy soft hyper K-ideals and its level sets are investigated. Image and pre images of the fuzzy soft hyper k-ideal under a fuzzy soft homo morphism are studied.

Keywords: *hyper k-algebra, hyper k-ideal, level sets, fuzzy soft homomorphism*

1. Introduction

The concept of hyper structure was introduced in 1934 by French mathematician, Marty [3], R.A. Borzooei et.al introduced the notion of a hyper K-algebra and hyper K-ideals. Based on the notion of fuzzy soft K-algebra and K-ideals by [5] Muhammad Abram, N.O. Alsheri and Rania Saeed Alghamdi, fuzzy soft hyper K-algebra and fuzzy soft hyper k-ideals of hyper k-algebras are introduced by present author. In this paper fuzzy soft hyper k-ideals and related properties are discussed. Examples are provided and characterization of fuzzy soft hyper k- ideals in terms of its level sets. is also dealt.

2. Preliminaries

In this section we first give fundamental definition and results in hyper K-algebra.

- Definition 2.1

By a hyper K-algebra we mean a nonempty set H endowed with a hyper operation "○" and a
Constant 0 satisfying the following axioms
(HK1) $(x \circ z) \circ (y \circ z) < x \circ y$
(HK2) $(x \circ y) \circ z = (x \circ z) \circ y$
(HK3) $x < x$
(HK4) $x < y$ & $y < x \Longrightarrow x = y$ for all $x, y, z \in H$ where $x < y$ is defined by $0 \in x \circ y$ & for every $A, B \subseteq H$ $A < B$ is defined by for $a \in A$ and there exists $b \in B$ such that $a < b$.
(HK5) $0 < x$ for all $x \in H$.
Then $(H, \circ, 0)$ is called a hyper K-algebra.
Let $(H, \circ, 0)$ be a hyper k-algebra and S be a subset of H containing 0. If S is a hyper K-algebra with respect to the hyper operation '○ ' on H, we say that S is a hyper K-subalgebra of H.

- Definition 2.2

A fuzzy set μin a set X is a function $\mu : X \to [0, 1]$.

- Definition 2.3

For a fuzzy set μ in X and $\propto \in [0, 1]$
Define $\cup(\mu; \propto) = \{ x \in H / \mu(x) \geq \propto \}$
Which is called a level set of μ.
Molodtsov [9] defined the notion of soft sts in the following way. Let U be an initial universe and E be a set of parameters.
Let P(U) denote the power set of U. Let A be a nonempty subset of E. A pair (f, A) is called a fuzzy soft set in the following way.
A pair (f, A) is called a fuzzy soft set over U where f is a mapping given by $f: A \to I^U$ where $I = [0, 1]$. In general, for every $\mathcal{E} \in A$ $f(\mathcal{E}) = f_{\mathcal{E}}$ is a fuzzy set of U and is called a fuzzy value set of parameters.
To solve decision making problems based on fuzzy soft sets Feng et al introduced the notion called t-level soft sets of fuzzy soft sets.

- Definition 2.4

Let (f, A) be a fuzzy soft set over U. For each $t \in [0, 1]$ the set $(f, A)^t = (f^t, A)$ is called an t – level soft set of (f, A) where $f_{\mathcal{E}}^{\ t} = \{x \in U / f_{\mathcal{E}}^{\ t}(x) \geq t\}$ for all $\mathcal{E} \in A$ Clearly $(f, A)^t$ is a soft set over U.

- Definition 2.5

Let (f, A) and (g, B) be two fuzzy soft sets over U. we say that (f, A) is a fuzzy soft subset of (g, B) and write (f, A) ⊆ (f, B) if

i) A ⊆ B
ii) f(Ɛ) ⊆ g(Ɛ) for all Ɛ ∈ A.

- Definition 2.6

Let (f, A) and (g, B) be two fuzzy soft sets over U. Then their extended intersection is a fuzzy soft set denoted by (h, C) where C = A ∪ B

and $h(\mathcal{E}) = \begin{cases} f_{\mathcal{E}} & \text{if } \mathcal{E} \in A - B \\ g_{\mathcal{E}} & \text{if } \mathcal{E} \in B - A \\ f_{\mathcal{E}} \cap g_{\mathcal{E}} & \text{if } \mathcal{E} \in A \cap B \end{cases}$ for all Ɛ ∈ C.

This is denoted by (h, C) = (f, A)$\widetilde{\cap}$(g, B)

- Definition 2.7

If (f, A) and (g, B) are two fuzzy soft sets over the same inverse U then "(f, A) AND (g, B) is a fuzzy soft set denoted by (f, A) ∧ (g, B) and is defined by (f, A) ∧ (g, B) = (h, A×B) where h (a, b) = f(a)∩ g(b) for all (a, b) ∈A×B. Here ∩ is the operation of fuzzy intersection.

- Definition 2.8

Let (f, A) and (g, B) be two fuzzy soft sets over U. Then their extended union denoted by (h,C) where C = A ∪ B is defined by

$h(\mathcal{E}) = \begin{cases} f_{\mathcal{E}} & \text{if } \mathcal{E} \in A - B \\ g_{\mathcal{E}} & \text{if } \mathcal{E} \in B - A \\ f_{\mathcal{E}} \cup g_{\mathcal{E}} & \text{if } \mathcal{E} \in A \cap B \end{cases}$ for all Ɛ ∈ C.

This is denoted by (h, C) = (f, A)$\widetilde{\cup}$(g, B)

- Definition 2.9

Let (f, A) and (g, B) be two fuzzy soft sets over a common universe U with A∩B ≠ ϕ. Then their restricted intersection is a fuzzy soft set (h, A∩B) denoted by (f, A)∩ (g, B) = (h, A∩B) where h (Ɛ) = f(Ɛ) ∩ g(Ɛ) for all Ɛ ∈ A∩B.

- Definition 2.10

Let (f, A) and (g, B) be two fuzzy soft sets over a common universe U with A∩B ≠ ϕ. Then their restricted union is denoted by (f, A)∪ (g, B) and is defined by (f, A) ∪ (g, B) = (h, C) where C= A∩B and for all Ɛ ∈ C, h (Ɛ) = f(Ɛ) ∪ g(Ɛ).

- Definition 2.11

Let (f, A) and (g, B) be two fuzzy soft sets over H. Then (f, A) OR (g, B) is a fuzzy soft set denoted by (f, A) ∪(g, B) and is defined by (f, A) ∨ (g, B) = (O, A×B) whereO (α, β) = f (α) ∨ g (β) for all α, β ∈ A×B Here ∨ is the operation of union of two fuzzy soft sets.

- Definition 2.12

A non-empty subset I of a hyper K-algebra H is called a hyper K-ideal of H if it satisfies

i) O∈ I
ii) (for all x, y ∈ H) x○y < I, y ∈I ➔ x ∈ I.

- Definition 2.13

A fuzzy set μ in H is called a fuzzy hyper K-ideal if it satisfies the following conditions

(F1) (for all x, y ∈ H) x < y ⇒μ(x) ≥ μ(y)

(F2) (for all x, y ∈H)μ(x) ≥min$\left\{\inf_{a \in x \circ y} \mu(a), \mu(y)\right\}$

3. Fuzzy Soft Hyper K-ideals

Let (f, A) be a fuzzy soft set over H where H is a hyper K-algebra.

Let A be a subset of E. If there exists Ɛ ∈ A such that f(Ɛ) is a fuzzy hyper K-ideal of H then we say that (f, A) is a fuzzy soft hyper K-ideal based on the parameter Ɛ.

If for all Ɛ ∈ A, $f_{\mathcal{E}}$ is a fuzzy hyper K-ideal of H, then we say that (f, A) is a fuzzy soft hyper K-ideal on H.

- Example 3.1

Let H= {0 a, b, c} be a hyper K-algebra with the following cayley Table.

○	0	a	b	c
0	{0}	{0}	{0}	{0}
a	{a}	{0}	{a}	{a}
b	{b}	{0}	{0}	{0}
c	{c}	{0,a}	{c}	{0, a, c}

Let (f, A) be a fuzzy soft set over H where A={e_1, e_2}

Define f_{e_1} on H by $f_{e_1}(0)$ = 0.9 $f_{e_1}(a)$=0.2, $f_{e_1}(b)$ = $f_{e_1}(c)$ = 0.6

Define f_{e_2} on H by $f_{e_2}(0)$ = 0.7, $f_{e_2}(a)$= 0.2, $f_{e_2}(b)$ 0.5,$f_{e_2}(c)$ = 0.4

We see thatf_{e_1}, f_{e_2} are fuzzy hyper K-ideals on H. Thus (f, A) is a fuzzy soft hyper k-ideal on H.

- Proposition 3.2

Let (f, A) and (g, B) be two fuzzy soft hyper K-ideals over H. then their extended intersection (f, A) $\tilde{\cap}$ (g, B) is also a fuzzy soft hyper K-ideal over H.

Proof:

Let (f, A)$\tilde{\cap}$ (g, B) = (h, C) where C= A∩B

Then $h(e) = \begin{cases} f(e) & \text{if } e \in A - B \\ g(e) & \text{if } e \in B - A \\ f(e) \cap g(e) & \text{if } e \in A \cap B \end{cases}$

Since (f, A) and (g, B) are fuzzy soft hyper K-ideals of H, h(e) is a fuzzy hyper K-ideal of H if e $\in A - B$ or B-A

Let e ∈ A ∩ B.

Then h(e) = f(e) ∩ g(e).

Let x, y ∈ H and x<y.

andh_e (x) = min { $f_e(x), g_e(x)$}

≥min { $f_e(y), g_e(y)$} = h_e (y)

Therefore h_e (x) ≥ h_e (y)

We prove the second condition of fuzzy hyper k-ideal

h_e (x) = min { $f_e(x), g_e(x)$}

≥min {min {$\inf_{a\in x\circ y} f_e(a), f_e(y)$}, min {$\inf_{a\in x\circ y} g_e(a), g_e(y)$}}

= min {min {$\inf_{a\in x\circ y} f_e(a)$,}, $\inf_{a\in x\circ y} g_e(a)$), min { f_e (y), $g_e(y)$}}

= min {$\inf_{a\in x\circ y}$[min{ $f_e(a), g_e(a)$ }], min { f_e (y), $g_e(y)$}}

= min[$\inf_{a\in x\circ y}$($f_e \cap g_e$) (a)), ($f_e \cap g_e$ (y)}

= min {$\inf_{a\in x\circ y} h_e(a), h_e(y)$}

Thus$h_e(x)$ ≥ min { $\inf_{a\in x\circ y} h_e(a), h_e(y)$}

⇒h(e) is a fuzzy hyper K-ideal on H.

Hence (f, A) $\tilde{\cap}$ (g, B) is a fuzzy soft hyper K-ideal on H.

- Proposition 3.3

Let (f, A) and (g, B) be two fuzzy soft hyper K-ideals on H then (f, A) AND (g, B) is a fuzzy soft hyper K-ideal on H.

Proof:

(f, A) AND (g, B) is defined by (f, A) ∧ (g, B) = (h, A×B)

Where h (a, b) = f(a) ∧ g(b) where (a, b) ∈ A×B.

Let x<y

Then $f_a(x) \geq f_a(y)$ and $g_b(x) \geq g_b(y)$

$h_{(a,b)}$ (x) =($f_a \cap g_b$) (x)

= min { $f_a(x), g_b(y)$}

≥min { $f_a(y), g_b(y)$}

=($f_a \cap g_b$)(y)

= $h_{(a,b)}$ (y)

$h_{(a,b)}$ (x) ≥ $h_{(a,b)}$ (y)

$h_{(a,b)}$ (x) = min { $f_a(x), g_b(x)$}

≥min {min {$\inf_{w\in x\circ y} f_a(w), f_a(y)$}, min {$\inf_{w\in x\circ y} g_b(w), g_b(y)$}}

= min [min {$\inf_{w\in x\circ y} f_a(w)$,$\inf_{w\in x\circ y} g_b(w)$}, min { f_a (y), $g_b(y)$}]

= min {$\inf_{w\in x\circ y}$ [min{ $f_a(w), g_b(w)$ }], min { f_a (y), $g_b(y)$}}

= min[$\inf_{w\in x\circ y}$($f_a \cap g_b$(w)), $f_a \cap g_b$ (y)}

= min { $\inf_{w\in x\circ y} h_{(a,b)}(w), h_{(a,b)}(y)$}

Thus $h_{(a,b)}(x)$ ≥ min { $\inf_{w\in x\circ y} h_{(a,b)}(w), h_{(a,b)}(y)$}

Thus (f, A) AND (g, B) is a fuzzy soft hyper K-ideal on H.

- Proposition 3.4

Let (f, A) and (g, B) be two fuzzy soft hyper K-ideal over H. Then (f, A) OR (g, B) is a fuzzy soft set hyper K-ideal over H.

Proof:

(f, A) OR (g, B) = (O, A×B) Where$O_{(\alpha,\beta)}(x)$ =($f_\alpha \cup g_\beta$)(x)

Let x<y

Then $f_\alpha(x) \geq f_\alpha(y)$

and$g_\beta(x) \geq g_\beta(y)$

$O_{(\alpha,\beta)}(x) = (f_\alpha \cup g_\beta)(x)$

= max { $f_\alpha(x), g_\beta(x)$}

$\geq$max { $f_\alpha(y)$, $g_\beta(y)$}$f_\alpha \cup g_\beta(y)$
= $O_{(\alpha,\beta)}(y)$
$O_{(\alpha,\beta)}(x)$ = max{$f_\alpha(x)$, $g_\beta(x)$}
$\geq$min { $f_\alpha(x)$, $g_\beta(x)$}
The rest of the proof follows from the previous proposition.
We state the following propositions without proof.

- Proposition 3.5

Let (f, A) and (g, B) be two fuzzy soft hyper K-ideals on H and A∩B ≠ ϕ. Then their restricted intersection (f, A)∩ (g, B) is a fuzzy soft hyper K-ideal on H.

- Proposition 3.6

Let (f, A) and (g, B) be two fuzzy soft hyper K-ideals on H. Then their restricted union (f, A) ∪(g, B) is a fuzzy soft hyper K-ideal on H.

- Definition 3.7

The relative complement of a fuzzy soft set (f, A) denoted by $(f, A)'$ is defined by $(f, A)'$ = (f', A) where f' : A→ F(P(U) by $f'(\alpha) = 1 - f(\alpha)$ for all α ∈ A.

- Note 3.8

The relative complement of a fuzzy soft hyper K-ideal is not a fuzzy soft hyper K-ideal.

- Proposition 3.9

Let (f, A) be a fuzzy soft hyper K-ideal on H and B is a subset of A Then ($f|_B$, B) is a fuzzy soft hyper k-ideal on H
Proof:
Obvious.
The following example shows that there exists a fuzzy soft set over H such that

i) (f, A) is not a fuzzy soft hyper K-ideal on H.
ii) There exists a subset B of A such that ($f|_B$, B) is a fuzzy soft hyper K-ideal on H.

Consider the example as given in 3.1 and H denotes the set of hotels
Consider the set of parameters A = {cheap, costly, moderate}, B = {cheap, moderate}
Let (f, A) be the fuzzy soft set over H
Then f(cheap), f(costly), f(moderate) are fuzzy sets defined as follows.

○	0	a	b	c
Cheap	0.9	0.2	0.6	0.5
Moderate	0.7	0.1	0.5	0.5
Costly	0.9	0.8	0.6	0.7

Table 1

(f, A) is not a fuzzy soft hyper K-ideal on H.
Since f(costly) is not a fuzzy hyper K-ideal on H
c○a = {○, a) hence c < a but $f_{costly}(c) \ngeq f_{costly}(a)$
whereas f(cheap) and f(moderate) are fuzzy hyper K-ideals on H.
We provide a characterization for fuzzy soft hyper k-ideals

- Theorem 3.10

(f, A) is a fuzzy soft hyper K-ideal on H if and only if its level subset ∪ (f_e, α) is a soft hyper K-ideal on H for all α∈ [0, 1].
Proof:
Let (f, A) be a fuzzy soft hyper K-ideal on H.
Let e ∈ A
Then f_e is a fuzzy hyper K-ideal on H
We claim that non-empty level set ∪ (f_e, α) is a hyper K-ideal for all α ∈ [0, 1]
∪ (f_e, α) ≠ ϕ ⇒there exists a ∈∪ (f_e, α)
⇒ $f_e(a) \geq \alpha$
Since 0≤x for all x ∈ H
0≤a in particular
$f_e(0) \geq f_e(a) \geq \alpha$
⇒0 ∈∪ (f_e, α)
Let x, y ∈ H be such that x ○ y <∪ (f_e, α) and y ∈∪ (f_e, α) then there exists a' ∈ x ○ y and b ∈∪ (f_e, α) such that $a' < b$
⇒ $f_e(a') \geq f_e(b) \geq \alpha$
⇒ $f_e(a') \geq \alpha$ for all a' ∈ x ○ y
Therefore $\inf_{a' \in x \circ y} f_e(a') \geq \alpha$also $f_e(y) \geq \alpha$

Since f_e is a fuzzy hyper K-ideal
$f_e(x) \geq \min \{ \inf_{a' \in x \circ y} f_e(a'), f_e(y) \} \geq \alpha$
Implies $x \in \cup (f_e, \alpha)$
Thus $x \circ y < \cup (f_e, \alpha)$ and $y \in \cup (f_e, \alpha)$
$\Rightarrow x \in \cup (f_e, \alpha)$
Hence $\cup (f_e, \alpha)$ is a hyper K-ideal.
Conversely,
Let (f, A) be a fuzzy soft set on H. Let e ∈ A. If the level set $\cup (f_e, t)$ for all t ∈ [0, 1] is a hyper K-ideal then (f, A) is a fuzzy soft hyper K-ideal based on e.
$f_e$is a fuzzy set on H.
Let x, y ∈ H be such that x<y
We will show that $f_e(x) \geq f_e(y)$
Consider $\cup(f_e, f_e(y))$
Let $x \circ y < \cup(f_e, f_e(y))$
and $y \in \cup(f_e, f_e(y))$
$\cup(f_e, f_e(y))$ is a hyper K-ideal, $\Rightarrow x \in \cup(f_e, f_e(y))$
$\Rightarrow f_e(x) \geq f_e(y)$
Let$\propto = \min \{ \inf_{a \in x \circ y} f_e(a), f_e(y) \}$
Then $f_e(y) \geq \propto$
$y \in \cup (f_e, \propto)$
for all $b \in x \circ y$, $f_e(b) \geq \inf_{a \in x \circ y} f_e(a)$
$\geq \min \{ \inf_{a \in x \circ y} f_e(a), f_e(y) \}$
$= \propto$
Therefore $f_e(b) \geq \propto$
$\Rightarrow b \in \cup (f_e, \propto)$
$\Rightarrow x \circ y \subseteq \cup (f_e, \propto)$
$\Rightarrow x \circ y < \cup (f_e, \propto)$
since $A \subseteq B \Rightarrow A < B$ in a hyper K-algebra and $y \in \cup (f_e, \propto)$
$\Rightarrow x \in \cup (f_e, \propto)$
$\Rightarrow f_e(x) \geq \propto$
$f_e(x) \geq \propto = \min \{ \inf_{a \in x \circ y} f_e(a), f_e(y) \}$
Thus f_e is a fuzzy hyper K-ideal.
We see that fuzzy soft hyper K-ideal is not a fuzzy soft hyper k-subalgebra. Consider the example given in 3.1 and the Table1 f(cheap) is a fuzzy hyper k-ideal but it is not a fuzzy hyper k sub algebra based on the same parameter cheap. Since the level set of the fuzzy set f(cheap) for $\propto = 0.5$ is {0, c, b} and c o c ={o, a,c}⊈,{0, c,b} Hence the level set is not a hyper k-subalgebra
A fuzzy soft hyper k-subalgebra need not be a fuzzy soft hyper k-ideal Let(f,A) be a fuzzy soft set and A={costly} We see that f(costly) is a hyper k-subalgebra but it is not a hyper k-ideal

- Definition 3.11

Let φ: X→ Y and ϑ: A→B be two functions A and B are parametric sets from the crisp setsX and Y respectively Then the pair(φ ϑ) is called a fuzzy soft function from X to Y

- Definition3.12

Let (f, A) and (g, B) be two fuzzy soft hyper K-ideals over H_1 and over H_2 respectively and let($\varphi_{,\vartheta}$) be a fuzzy soft function from H_1 to H_2

1) The image of (f, A) under the fuzzy soft function(φ, ϑ) denoted by($\varphi, _\vartheta$) (f, A) =(φ(f), ϑ(A)) where for all k ∈ ϑ(A), y ∈ H_2

$\varphi(f)_k(y) = \vee\varphi(x)=y \ \vee \vartheta(a)=k \ f_a(x)$ if $x \in \vartheta^{-1}(y)$, 0 otherwise

2) The preimage of (g, B) under the fuzzy soft function (φ, ϑ) denoted by ($\varphi, _\vartheta$)-1(g, B) is the fuzzy soft set over H_1 defined by (φ, ϑ)-1(g, B) =($\varphi^{-1}(g), \vartheta^{-1}(B)$) where $\varphi^{1}(g)_a(x) = g(\varphi(x))$ for all $a \in \vartheta^{-1}(B)$, for all $x \in H_1$

- Definition3.13

Let(φ, ϑ) be a fuzzy soft function from H_1 to H_2. If φ is a homomorphism from H_1 to H_2 then (φ, ϑ) is said to be a fuzzy soft homomorphism If φis an isomorphism from H_1 to H_2 and ϑ is a1-1 mapping from A to B then (φ, ϑ) is said to be a fuzzy soft isomorphism

- Theorem3.14

Let (φ, ϑ) be a fuzzy soft homomorphism from (H_1 0_1) to(H_2,0_2) If(f, A) is a fuzzy soft hyper K ideal over H_1 then (φ, ϑ)(f, A) is a fuzzysoft hyper k-ideal over H_2
Proof:
Let k ∈ ϑ(A) and $y_1, y_2 \in H_2$ If $\varphi^{-1}(y_1) = \varphi^{-1}(y_2)$ is a empty set then the proof is obvious

Let $\varphi^{-1}(y_1)$ and $\varphi^{-1}(y_2)$ be not empty sets and let $\varphi^{-1}(y_1) < \varphi^{-1}(y_2)$ then there exists x_1 and $x_2 \in H_1$ such that $\varphi(x_1) = y_1$ and $\varphi(x_2) = y_2$ For $x_1^1 \in \varphi^{-1}(y_1)$ there exists $x_2^1 \in \varphi^{-1}(y_2)$ such that $x_1^1 < x_2^1$ Since (f, A) is a fuzzy soft hyper k-ideal of $H_1 f_a(x_1^1) \geq f_a(x_2^1)$ therefore $\vee \varphi(x_1^1)=y_1 \; f_a(x_1^1) \geq \vee \; \varphi(x_2^1)=y_2 f_a(x_2^1)$

$\varphi(f)_k(y_1) = \vee \vartheta(a)=k \vee \; \varphi(x_1^1)=y_1 \; f_a(x_1^1) \geq \vee \vartheta(a)=k \; (\vee \; \varphi(x_2^1)=y_2 \; f_a(x_2^1))$

$=\varphi(f)_k(y_2)$

Let u and $v \in H_1$

$\varphi_{,(}u) = y_1$ $\varphi_{,(}v) = y_2$

Then $f_a(u) \geq \min \{ \inf_{w \in (u 0_1 v)} fa(w), fa(v) \}$

Let $z \in y_1 \; 0_2 \; y_2 = \varphi(u 0_1 v)$

Then $z = \varphi_{,(}w)$ where $w \in u 0_1 v$

$\vee \varphi_{,(}u) = y_1 \geq \vee \varphi_{(}v) = y_2, \; \varphi(w)=z \quad \min \{ \inf_{w \in u 0_1 v} fa(w), fa(v) \}$

$\varphi(f)_k(u) = \vee \vartheta(a)=k \vee \varphi(u) = y1 \quad fa(u) \geq \vee \vartheta(a)=k \min\{ \inf_{w \in u 0_1 v} fa(w), fa(v) \}$

- Theroem 3.15

Let (φ, ϑ) be a fuzzy soft homomorphism from $(H_1 \; 0_1)$ to$(H_2, 0_2)$ If (g, B) is a fuzzy soft hyper K ideal over H_2 then (φ, ϑ)-1(g, B) is a fuzzysoft hyper k-ideal over H_1

Proof:

Let (g, B) be a fuzzy soft hyper K ideal over H_2 Let $a \in \vartheta^{-1}(B))$ and u, v $\in H_1$be such that u< v which implies $\varphi_{(}u) < \varphi_{,(}v)$ and $\varphi_{(}u) = y, \varphi_{(}v) = z, \varphi^{-1}(g)_a (u) = g_{\vartheta(a)} (\varphi(u))$

$= g_{\vartheta(a)} (y)$

$\geq g_{\vartheta(a)} (z)$

$= g_{\vartheta(a)} \varphi_{(}v)$

$= \phi - 1(g)_a(v)$

, $\varphi^{-1}(g)_a (u) = g_{\vartheta(a)} (\varphi(u)) = g_{\vartheta(a)} (y)$

$\geq \min\{ \inf_{w \in y 0_2 z} g_{\vartheta(a)}(w), g_{\vartheta(a)} (z)\}$

$= \min\{ \inf_{\varphi,(t) \in \phi(u) 0_2 (\phi(v)} g_{\vartheta(a)} (\phi(t)), g_{\vartheta(a)} (\varphi(v))\}$ where $w = \varphi_{,(}t)$ for some $t \in u \; 0_1 \; v$

$= \min\{ \inf_{\phi(t) \in \phi(u o v)} \phi - 1(g)_a (t), \phi - 1(g)_a(v) \}$

This completes the proof

4. Conclusion

In this paper some properties of fuzzy soft hyper K-ideals of a hyper K-algebra are studied and the characterization of a fuzzy soft hyper-ideal in terms of its level sets is provided and any relation existing between the fuzzy soft hyperk-subalgebras and the fuzzy soft hyper k-ideals is analyzed. Image and pre image of a fuzzy soft hyper k-ideal under a fuzzy soft homomorphism are also studied. In the author's opinion these results maybe extended to intuitionistic hyper K-algebra.

5. Acknowledgement

This research is financially supported by the University grants commission (SERO|U. G. C) Hyderabad, India under project No F MRP 5331/14.

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