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Modified hybrid fuzzy algebra: MF-Algebra

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Abstract
The principles of modified hybrid fuzzy algebras (MF-Algebra) are introduced in this study. The notions of hybrid fuzzy algebra and several properties related to these ideas are investigated. This work investigates the connections between fuzzy algebra and fuzzy subalgebra.

1. Introduction

Imai and Iseki published the initial research on BCK/BCI algebras as an extension of set-theoretic difference and propositional calculus in 1966 [6, 7]. According [14] invented B-algebras, which are related to a number of well-known algebras such as BCI/BCK-algebras. The authors [5, 10-19] proposed interval-valued intuitionistic fuzzy closed ideals of BG-algebras, intuitionistic L-fuzzy ideals, and intuitionistic fuzzy subalgebra, as well as some of their essential properties.

Since Zadeh [12] established the idea of a fuzzy subset of a set in 1965, scientists have been interested in extending the conceptions and discoveries of every mathematical concept to the boundary framework of fuzzy settings. Imai and Iseki [6] translated set theoretic difference and propositional calculus into BCK-algebras, and Iseki [7] created BCI-algebra, which is an extension of BCK-algebra [10]. Used the fuzzy set notion to produce fuzzy subalgebra and fuzzy ideals in BCK-algebra. Neggers and Kim [9] investigated the link between d-algebras and BCK-algebras in 1996 and discovered that the d-algebra class is a subset of BCK-algebras.

Akram and Dar [1] developed fuzzy d-algebra, fuzzy subalgebra, and fuzzy d-ideals of d-algebra. Kim introduced the concept of fuzzy dot subalgebra in d-algebra in [8]. In a d-algebra, Al-Shehrie [2] popularised the concept of fuzzy dot d-ideals. Un and colleagues [11]. By extending the concept of intuitionistic fuzzy set to d-algebra, fuzzy d-algebra and intuitionistic fuzzy topological d-algebra were created. According to Ravi [18-19] also compared various fuzzy graphs compared to algebra and other related fuzzy concepts. In this paper, we proposed the notions of intuitionistic fuzzy dot subalgebra and intuitionistic fuzzy dot d-ideals of d-algebra and investigated a variety of intriguing properties. This article provides an overview of fuzzy graphs and its variants. This section will only examine the types of fuzzy graphs, not their operations or properties. Section 2 deals to the basic preliminaries with notations.

2. Preliminaries

This section contains some key aspects relevant to this topic. Kim & Kim discovered a major family of logical algebras known as BG-algebras, which has subsequently been thoroughly explored by numerous researchers. This algebra is defined further down.

3. Notations

Subalgebra – $S\dot{\omega}$
Fuzzy subset – FS
Intuitionistic fuzzy set - IFS
Intuitionistic fuzzy – IF

Non-empty set –NES
non-empty subset- NESS

A BG- algebra is a NES with the binary operation * and constant 0 that obeys the following axioms.
1. ⊐*⊐=0
2. ⊐*0=⊐
(⊐*δ) * (0*δ) =⊐, for all ⊐,δ⊡⊐.
A Sⓦ is a NES S of a BG-algebra ⊐ is called a Sⓦ of ⊐ if ⊐*δ⊡S for any ⊐, δ⊡S.

If ⊐ is the common name ⊐ for a group of items, then a fuzzy set ⊐ in is defined as A={ <⊐, μ(⊐)>::⊐⊡⊐}, where μ(⊐) is called the membership value of ⊐ in μ and 0≤ μ(⊐)≤1.
In BG-algebra ⊐, a fuzzy set μ is referred to as a fuzzy Sⓦ of ⊐ if μ (⊐*δ)≥low{ μ(⊐), μ(δ)} for all ⊐,δ⊡⊐.

Definition 1. A d-algebra is a NES with a binary operation and a constant 0 that meets the following axioms.
⊐ ∗ ⊐ = 0
0 ∗ ⊐ = 0
⊐ ∗ δ = 0 and δ ∗ ⊐ = 0 ⇒ ⊐ = δ for all ⊐, δ ∈ ⊐. For brevity we also call ⊐ a d-algebra.

Definition 2. A NESS S of a d-algebra ⊐ is called a Sⓦ of ⊐ if ⊐ ∗ δ ∈ S, for all ⊐, δ ∈ S.

Definition 3. A NESS I of a d-algebra ⊐ is called an ideal of ⊐ if γ δ
0 ∈ I
⊐ ∗ δ ∈ I and δ ∈ I ⇒ ⊐ ∈ I
⊐ ∈ I and δ ∈ ⊐ ⇒ ⊐ ∗ δ ∈ I.

Definition 4. A FS μ of ⊐ is called a fuzzy dot Sⓦ of a d-algebra ⊐ if for all ⊐, δ ∈ ⊐, μ(⊐ ∗ δ) ≥ μ(⊐).μ(δ), where. (dot) denotes ordinary multiplication.

Definition 5. A fuzzy subset μ of ⊐ is called a fuzzy d-ideal of ⊐ if it satisfies the following conditions:
(i) μ(0) ≥ μ(⊐)
μ(⊐) ≥ low{μ(⊐ ∗ δ), μ(δ)}
μ(⊐ ∗ δ) ≥ low{μ(⊐), μ(δ)}.

Definition 6. A FS μ of ⊐ is called a fuzzy dot d-ideal of ⊐ if it satisfies the following conditions:
(i) μ(0) ≥ μ(⊐)
μ(⊐) ≥ μ(⊐ ∗ δ).μ(δ)
μ(⊐ ∗ δ) ≥ μ(⊐).μ(δ) for all ⊐, δ ∈ ⊐.

Definition 7. An intuitionistic fuzzy set (IFS) A of a d-algebra ⊐ is an object of the form A = {< ⊐, μ_A(⊐), ν_A(⊐) > |⊐ ∈ ⊐ }, where μ_A: ⊐ → [0, 1] and ν_A: ⊐ → [0, 1] with the condition 0 ≤ μ_A(⊐) +ν_A(⊐) ≤ 1, ∀⊐ ∈ ⊐. The numbers μ_A(⊐) and ν_A(⊐) denote respectively the degree of membership and the degree of non-membership of the element ⊐ in set A. For the sake of simplicity, we shall use the symbol A = (μ_A, ν_A) for the IFSA = {< ⊐, μ_A(⊐), ν_A(⊐) > | ⊐ ∈ ⊐ }. The function π_A(⊐) = 1 − μ_A(⊐) −ν_A(⊐) for all ⊐ ∈ ⊐. Here π_A(⊐) is called the degree of hesitance of ⊐ ∈ A.

Definition 8. If A = {< ⊐, μ_A(⊐), ν_A(⊐) > |⊐ ∈ ⊐ } and B = {< ⊐, μ_B(⊐), ν_B(⊐) > |⊐ ∈ ⊐ } are any two IFS of a set ⊐, then A ⊆ B if and only if for all ⊐ ∈ ⊐, μ_A(⊐) ≤ μ_B(⊐) and ν_A(⊐) ≥ ν_B(⊐),
A = B if and only if for all ⊐ ∈ ⊐, μ_A(⊐) = μ_B(⊐) and ν_A(⊐) = ν_B(⊐), A ∩ B = {< ⊐, (μ_A ∩ μ_B)(⊐), (ν_A ∪ ν_B)(⊐) > |⊐ ∈ ⊐ },
where (μ_A ∩ μ_B)(⊐) = low{μ_A(⊐), μ_B(⊐)} and (ν_A ∪ (ν_B)(⊐) = upper{ν_A(⊐), ν_B(⊐)}, A ∪ B = {< ⊐, (μ_A ∪ μ_B)(⊐), (ν_A ∩ ν_B)(⊐) > |⊐ ∈ ⊐ },
where (μ_A ∪ μ_B)(⊐) = upper{μ_A(⊐), μ_B(⊐)} and (ν_A ∩ ν_B)(⊐) = low{ν_A(⊐), ν_B(⊐)}.

Definition 9. An IFSA = {< ⊐, μ_A(⊐), ν_A(⊐) > |⊐ ∈ ⊐ } of d-algebra ⊐ is called an IF Sⓦ of ⊐ if it satisfies the following conditions:
μ_A(⊐ ∗ δ) ≥ low{μ_A(⊐), μ(δ)}
ν_A(⊐ ∗ δ) ≤ upper{ν_A(⊐), ν_A(δ)} for all ⊐, δ ∈ ⊐.

Definition 10. An IFSA = {< ⊐, μ_A(⊐), ν_A(⊐) > |⊐ ∈ ⊐ } of d-algebra ⊐ is called an IF d-ideal of ⊐ if it satisfies the following conditions:
μ_A(0) ≥ μ_A(⊐)
μ_A(⊐) ≥ low{μ_A(⊐ ∗ δ), μ(δ)}
μ_A(⊐ ∗ δ) ≥ low{μ_A(⊐), μ_A(δ)} for all ⊐, δ ∈ ⊐.
ν_A(0) ≤ ν_A(⊐)
ν_A(⊐) ≤ upper{ν_A(⊐ ∗ δ), μ(δ)}
ν_A(⊐ ∗ δ) ≤ upper{ν_A(⊐), ν_A(δ)} for all ⊐, δ ∈ ⊐.

Definition 11. For any IFS A = {< ⊐, μ$_A$(⊐), ν$_A$(⊐) > |⊐ ∈ ⊐ } of ⊐ and ζ ∈ [01], the operator Q: IFS(⊐) → IFS(⊐), ◊:
IFS(⊐) → IFS(⊐), D$_ζ$: IFS(⊐) → IFS(⊐) are defined as
Q(A) = {< ⊐, μ$_A$(⊐), 1 − μ$_A$(⊐) > |⊐ ∈ ⊐ } is called necessity operator
◊(A) = {< ⊐, 1 −ν$_A$(⊐), ν$_A$(⊐) > |⊐ ∈ ⊐ } is called possibility operator
D$_ζ$(A) = {< ⊐, μ$_A$(⊐) + ζ π$_A$(⊐), ν$_A$(⊐) + (1 −ζ)π$_A$(⊐) > |⊐ ∈ ⊐ } is called ζ -Model operator.
Clearly Q(A) ⊆ A ⊆ ◊(A) and the equality hold, when A is a fuzzy set also D$_0$(A) = Q(A) and D$_1$(A) = ◊(A). Therefore the ζ -
Model operator D$_ζ$(A) is an extension of necessity operator Q(A) and possibility operator ◊(A).

Definition 12. For any IFS A = {< ⊐, μ$_A$(⊐), ν$_A$(⊐) > |⊐ ∈ ⊐ } of ⊐ and for any ζ, ξ ∈ [01] such that ζ +ξ ≤ 1, the (ζ, ξ)- model
operator F$_{ζ,ξ}$: IFS(⊐) → IFS(⊐) is defined as F$_{ζ,ξ}$ (A) = {< ⊐, μ$_A$(⊐) +ζ π$_A$(⊐), ν$_A$(⊐) +ξ π$_A$(⊐) > |⊐ ∈ ⊐ }, where π$_A$(⊐) = 1 − μ$_A$(⊐)
−ν$_A$(⊐) for all ⊐ ∈ ⊐. Therefore we can write
F$_{ζ,ξ}$ (A) as F$_{ζ,ξ}$ (A)(⊐) = (μ$_F$ζ,ξ (A)(⊐), ν$_F$ζ,ξ (A)(⊐))
where μ$_F$ζ,ξ (⊐) = μ$_A$(⊐) + ζ π$_A$(⊐) and ν$_F$ζ,ξ (A)(⊐)) = ν$_A$(⊐) + ξ π$_A$(⊐).
Clearly, F$_{0,1}$(A) = Q(A), F$_{1,0}$(A) = ◊(A) and F$_{ζ,1−ζ}$(A) = D$_ζ$(A).

Remark
If ⊐ and Δ be two d-algebras, then ⊐ × ⊐ is also a d-algebra under the binary operation ′∗′ defined in ⊐ × ⊐ by
(⊐, δ) ∗ (p, q) = (⊐ ∗ p, δ ∗ q) for all (⊐, δ), (p, q) ∈ ⊐ × ⊐.

Definition 14. Let A =< μ$_A$, ν$_A$ > be IF subset of ⊐ and ζ, ξ ∈ [0, 1] then (ζ, ξ) cut set of A is A$_{(ζ,ξ)}$ = {⊐ | ⊐ ∈ ⊐, μ$_A$(⊐) ≥ ζ   and
ν$_A$(⊐) ≤ ξ }
Lemma 1. If a, b, c, d ∈ [0, 1], then
–low {a, b} ≥ a.b
–upper {a, b} ≤ a + b − a.b
–low {a.b, c.d} ≥ low{a, c}.low{b, d}.

Modified Hybrid Fuzzy Algebra (MF-Algebra)
Definition 15. An IFSA = {< ⊐, μ$_A$(⊐), ν$_A$(⊐) > |⊐ ∈ ⊐ } of d-algebra ⊐ is called an IF dot S$\dot{φ}$ of ⊐ if it satisfies the following
conditions:
μ$_A$(⊐ ∗ δ) ≥ μ$_A$(⊐).μ(δ)
ν$_A$(⊐ ∗ δ) ≤ ν$_A$(⊐) + ν$_A$(δ) −ν$_A$(⊐).ν$_A$(δ) for all ⊐, δ ∈ ⊐.

Definition 16. An IFSA = {< ⊐, μ$_A$(⊐), ν$_A$(⊐) > |⊐ ∈ ⊐ } of d-algebra ⊐ is called an IF dot d-ideal of ⊐ if it satisfies the following
conditions:
μ$_A$(0) ≥ μ$_A$(⊐)
μ$_A$(⊐) ≥ μ$_A$(⊐ ∗ δ).μ(δ)
μ$_A$(⊐ ∗ δ) ≥ μ$_A$(⊐).μ$_A$(δ) for all ⊐, δ ∈ ⊐.
ν$_A$(0) ≤ ν$_A$(⊐)
ν$_A$(⊐) ≤ ν$_A$(⊐ ∗ δ) + ν$_A$(δ) −ν$_A$(⊐ ∗ δ).ν$_A$(δ)
ν$_A$(⊐ ∗ δ) ≤ ν$_A$(⊐) + ν$_A$(δ) −ν$_A$(⊐).ν$_A$(δ) for all ⊐, δ ∈ ⊐.
Example 1. Consider d-algebra ⊐ = {0, a, b, c} with the following cayley table.

∗	0	e	f	g
0	0	0	0	0
e	e	0	0	E
f	f	f	0	0
g	g	g	e	0

The IF subset E = {< ⊐, μ$_A$(⊐), ν$_A$(⊐) > |⊐ ∈ ⊐ } given by μ$_E$(0) = μ$_E$(b) = 0.6, μ$_E$(a) = μ$_E$(c) = 0.5 and ν$_E$(0) = ν$_E$(a) = 0.3, ν$_E$(b) =
ν$_E$(c) = 0.4 then it is easy to verify that E = {< μ$_E$(⊐), ν$_E$(⊐) >} is an IF dot d-ideal of ⊐.

Theorem 1. Every IF d-ideal of d algebra ⊐ is an IF dot d-ideal of ⊐.

Proof. Let E = {< ⊐, μ$_A$(⊐), ν$_A$(⊐) > |⊐ ∈ ⊐ } be an IF d-ideal of ⊐, therefore we have
μ$_A$(0) ≥ μ$_A$(⊐)
μ$_A$(⊐) ≥ low{μ$_A$(⊐ ∗ δ), μ$_A$(δ)}
μ$_A$(⊐ ∗ δ) ≥ low{μ$_A$(⊐), μ$_A$(δ)} for all ⊐, δ ∈ ⊐.
ν$_E$(0) ≤ ν$_E$(⊐)
ν$_E$(⊐) ≤ upper{ν$_E$(⊐ ∗ δ), μ(δ)}
ν$_E$(⊐ ∗ δ) ≤ upper{ν$_E$(⊐), ν$_E$(δ)} for all ⊐, δ ∈ ⊐.
Now μ$_E$(⊐) ≥ low{μ$_E$(⊐ ∗ δ), μ(δ)} ≥ μ$_E$(⊐ ∗ δ).μ(δ) and μ$_E$(⊐ ∗ δ) ≥ low{μ$_E$(⊐).μ$_E$(δ)} ≥ μ$_E$(⊐).μ$_E$(δ) for all ⊐, δ ∈ ⊐.
Also ν$_E$(⊐) ≤ upper{ν$_E$(⊐ ∗ δ), μ(δ)} ≤ ν$_E$(⊐ ∗ δ) + μ$_E$(δ) − ν$_E$(⊐ ∗ δ).ν$_E$(δ) and ν$_E$(⊐ ∗ δ) ≤ upper{ν$_E$(⊐), ν$_E$(δ)} ≤ ν$_E$(⊐) + μ$_E$(δ) −
ν$_E$(⊐).ν$_E$(δ) for all ⊐, δ ∈ ⊐.
Hence the proof.

Remark. The converse of Theorem 1 is not true as shown in following Example.

Example 2. Consider d-algebra $\beth = \{0, a, b\}$ with the following cayley table.

*	0	a	b
0	0	0	0
a	b	0	b
b	a	a	0

$\nu_E(0) = 0.2$, $\nu_E(a) = 0.3$, $\nu_E(b) = 0.2$ then $E = <\mu_E, \nu_E>$ is an IF dot d-ideal of $\beth$. But $E = <\mu_E, \nu_E>$ is not an IF d-ideal of $\beth$. Since $\mu_E(a) = 0.2 \geq \text{low}\{\mu_E(a * b), \mu_E(b)\} = \text{low}\{\mu_E(b), \mu_E(b)\} = 0.2$.

Theorem 2. Every IF dot d-ideal of a d algebra $\beth$ is IF dot S$\dot{\omega}$ of $\beth$.

Remark. The converse of Theorem 2 is not true.

Example 3. Consider d-algebra $\beth$ as in Example 2 and IF subset $E = \{<\beth, \mu_E(\beth), \nu_E(\beth)> | \beth \in \beth \}$ given by $\mu_E(0) = 0.1$, $\mu_E(a) = 0.2$, $\mu_E(b) = 0.2$ and $\nu_E(0) = 0.2$, $\nu_E(a) = 0.2$, $\nu_E(b) = 0.1$ then it can be easily verified that $E = <\mu_E, \nu_E>$ is an IF dot S$\dot{\omega}$ of $\beth$. But $E = <\mu_E, \nu_E>$ is not an IF dot d ideal $\beth$. Since $\mu_E(0) = 0.1 \geq \mu_E(a) = 0.2$ and $\nu_E(0) = 0.2$ $\mu_E(b) = 0.2$.

Theorem 3. If $E = \{<\beth, \mu_E(\beth), \nu_E(\beth)> | \beth \in \beth \}$ and $F = \{<\beth, \mu_F(\beth), \nu_F(\beth)> | \beth \in \beth\}$ are two IF dot d-ideals of $\beth$ d-algebra $\beth$, Then $(A \cap B)$ is also an IF dot d-ideal of $\beth$.

Proof. We have $A \cap B = \{<\beth, (\mu_A \cap \mu_B)(\beth), (\nu_A \cup \nu_B)(\beth)> | \beth \in \beth \}$,
where $(\mu_A \cap \mu_B)(\beth) = \text{low}\{\mu_A(\beth), \mu_B(\beth)\}$ and $(\nu_A \cup \nu_B)(\beth) = \text{upper}\{\nu_A(\beth), \nu_B(\beth)\}$
Let $\beth, \delta \in \beth$, then
(i)$(\mu_E \cap \mu_F)(0) = \text{low}\{\mu_E(0), \mu_F(0)\}$
$= \text{low}\{\mu_E(0), \mu_F(0)\}$
$\geq \text{low}\{\mu_E(\beth), \mu_F(\beth)\}$
$= (\mu_E \cap \mu_F)(\beth)$
$\Rightarrow (\mu_E \cap \mu_F)(0) \geq (\mu_E \cap \mu_F)(\beth)$ (ii)$(\nu_E \cup \nu_F)(0) = \text{upper}\{\nu_E(0), \nu_F(0)\}$
$= \text{upper}\{\nu_E(0), \nu_F(0)\}$
$\leq \text{upper}\{\nu_E(\beth), \nu_F(\beth)\}$
$= (\nu_E \cup \nu_F)(\beth)$
$\Rightarrow (\nu_E \cup \nu_F)(0) \leq (\nu_E \cup \nu_F)(\beth)$ (iii)$(\mu_E \cap \mu_F)(\beth) = \text{low}\{\mu_E(\beth), \mu_F(\beth)\}$
$\geq \text{low}\{\mu_E(\beth * \delta).\mu_E(\delta), \mu_F(\beth * \delta).\mu_F(\delta)\}$
$\geq \text{low}\{\mu_E(\beth * \delta), \mu_F(\beth * \delta)\}.\text{low}\{\mu_E(\delta), \mu_F(\delta)\}\}$
$= (\mu_E \cap \mu_F)(\beth * \delta).(\mu_E \cap \mu_F)(\delta)\}\}$
$\Rightarrow (\mu_E \cap \mu_F)(\beth) \geq (\mu_E \cap \mu_F)(\beth * \delta).(\mu_E \cap \mu_F)(\delta)\}\}$.
(iv) $(\nu_E \cup \nu_F)(\beth)$
$= \text{upper}\{\nu_E(\beth), \nu_F(\beth)\}$
$\leq \text{upper}\{\nu_E(\beth * \delta) + \nu_E(\delta) - \nu_E(\beth * \delta).\nu_E(\delta), \nu_F(\beth * \delta) + \nu_E(\delta) - \nu_E(\beth * \delta).\nu_E(\delta)\}$
$\leq \text{upper}\{\nu_E(\beth*\delta), \nu_F(\beth*\delta)\} + \text{upper}\{\nu_E(\delta), \nu_F(\delta)\} - \text{upper}\{\nu_E(\beth*\delta), \nu_E(\beth*\delta)\}.\text{upper}\{\nu_E(\delta), \nu_F(\delta)\}$. By Lemma 2
$\Rightarrow (\nu_E \cup \nu_F)(\beth) \leq (\nu_E \cup \nu_F)(\beth * \delta) + (\nu_E \cup \nu_F)(\delta) - (\nu_E \cup \nu_F)(\beth * \delta).(\nu_E \cup \nu_F)(\delta)$.
(v)$(\mu_E \cap \mu_F)(\beth * \delta) = \text{low}\{\mu_E(\beth * \delta), \mu_F(\beth * \delta)\}$
$\geq \text{low}\{\mu_E(\beth), \mu_F(\beth)\}.\text{low}\{\mu_E(\delta), \mu_F(\delta)\}$
$= (\mu_E \cap \mu_F)(\beth)\}.(\mu_E \cup \mu_F)(\delta)\}$
$\Rightarrow (\mu_E \cap \mu_F)(\beth * \delta) \geq (\mu_E \cap \mu_F)(\beth).(\mu_E \cap \mu_F)(\delta)$.
(vi) $(\nu_E \cup \nu_F)(\beth * \delta)$
$= \text{upper}\{\nu_E(\beth * \delta), \nu_F(\beth * \delta)\}$
$\leq \text{upper}\{\nu_E(\beth) + \nu_F(\delta) - \nu_E(\beth).\nu_F(\delta), \nu_E(\beth) + \nu_E(\delta) - \nu_F(\beth).\nu_E(\delta)\}$
By Lemma 2
$\Rightarrow (\nu_E \cup \nu_F)(\beth * \delta) \leq (\nu_E \cup \nu_F)(\beth) + (\nu_E \cup \nu_F)(\delta) - (\nu_E \cup \nu_F)(\beth).(\nu_E \cup \nu_F)(\delta)$.
Hence $(A \cap B)$ is also an IF dot d-ideal of $\beth$.

Theorem 4. IF $C_{\zeta,\xi}(E) = \{\beth \in \beth \mid \mu_E(\beth) \geq \zeta, \nu_E(\beth) \leq \xi \}$ is an ideal of $\beth$, then $E = <\mu_E, \nu_F>$ is an IF dot d-ideal of $\beth$, where $\zeta, \xi \in [0, 1]$.

Proof. Let $C_{\zeta,\xi}(E)$ is an ideal. To prove $E = <\mu_E, \nu_F>$ is an IF dot d-ideal of $\beth$. In view of Theorem 1 it is enough to show that $E = <\mu_E, \nu_F>$ is an IF d-ideal of $\beth$.
Let $\beth \in \beth$ such that $\mu_A(\beth) = \zeta$. Also since $0 \in C_{\zeta,\xi}(A)$.
Therefore $\mu_E(0) \geq \zeta = \mu_E(\beth)$.
Let $\beth * \delta, \delta \in \beth$, such that $\mu_E(\beth * \delta) = \zeta$, $\mu_E(\delta) = \beth$ where $\zeta \leq \beth$.
Then $(\beth * \delta), \delta \in C_{\zeta,\xi}(E)$. Since $C_{\zeta,\xi}(E)$ is an ideal.
Therefore $\beth \in C_{\zeta,\xi}(E)$, which implies
$\mu_E(\beth) \geq \zeta = \text{low}\{\zeta, \beth\} = \text{low}\{\mu_E(\beth * \delta), \mu_E(\delta)\}$.

Again let $\beth$, $\delta \in \beth$ such that $\mu_E(\beth) = \zeta$, $\mu_E(\delta) = \beth$ where $\zeta \leq \beth$ Then $\beth$, $\delta \in C_{\zeta,\xi}(E)$ Since $C_{\zeta,\xi}(E)$ is an ideal Therefore $\beth * \delta \in C_{\zeta,\xi}(E)$, which implies

$\mu_E(\beth * \delta) \geq \zeta = \text{low}\{\zeta, \beth\} = \text{low}\{\mu_E(\beth), \mu_E(\delta)\}$.

Similarly we can prove $\nu_E(0) \leq \nu_E(\beth)$

$N_E(\beth) \leq \text{upper}\{\nu_E(\beth * \delta), \nu_E(\delta)\}$ and

$\nu_E(\beth * \delta) \leq \text{upper}\{\nu_E(\beth), \nu_E(\delta)\}$.

4. Conclusion

In this paper, we investigated IF H algebra and discovered a number of surprising results. As we have shown, the H-ideal is the intersection of any two IF dots. We may define IF dot H-ideals in a variety of algebraic systems using the same way. Model operator and are invariant IF dot H-ideals.

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