Research Article
Volume 9:1, 2020
DOI: 10.37421/jacm.2020.9.462

Journal of
Applied & Computational Mathematics

ISSN: 2168-9679

Open Access

Intuitionistic Fuzzy Ideals Supra Topological Spaces

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Abstract

In this paper we introduce the notion of intuitionistic fuzzy ideals in intuitionistic fuzzy supra topological spaces. The concept of an intuitionistic fuzzy s-local function is also introduced here by utilizing the s-neighbourhood structure for an intuitionistic fuzzy supra topological space. These concepts are discussed with a view to find new intuitionistic fuzzy supra topologies from the original one. The basic structure, especially a basis for such generated intuitionistic fuzzy supra topologies and several relations between different intuitionistic fuzzy ideals and intuitionistic fuzzy supra topologies are also studied here. Moreover, we introduce an intuitionistic fuzzy set operator Ψ_S and study its properties. Finally, we introduce some sets of fuzzy ideal supra topological spaces (fuzzy ∗-supra dense-in-itself sets, fuzzy S∗-supra closed sets, fuzzy ∗-supra perfect sets, fuzzy regular-I-supra closed sets, fuzzyI-supra open sets, fuzzy semi-I-supra open sets, fuzzy pre-I-supra open sets, fuzzy α-I-supra open sets, fuzzy β-I-supra open sets) and study some characteristics of theses sets and then we introduce some fuzzy ideal supra continuous functions.

Keywords: Intuitionistic fuzzy ideals • Intuitionistic fuzzy supra topology • Intuitionistic fuzzy s-local function

Introduction

The concept of a fuzzy set was introduced by Zadeh in 1965 [1]. In fuzzy set theory, the membership of an element to a fuzzy set is a single value between 0, 1. However in reality, it may not always be true that the degree of non-membership of an element in a fuzzy set is equal to 1 minus the membership degree because there may be some hesitation degree. Therefore, a generalization of fuzzy sets was proposed by Atanassov in 1986 [2] as intuitionistic fuzzy sets which incorporate the degree of hesitation called hesitation margin (and is defined as 1 minus the sum of membership and non-membership degrees respectively).Intuitionistic fuzzy set as generalized fuzzy set is quite interesting and useful in many application areas. The concept intuitionistic fuzzy set become more meaningful, resourceful and applicable since it includes the degree of belongingness, degree of non-belongingness and the hesitation margin Atanassov in 1994 [3], 1999 [4]. In 2001 and 2004 [5] , Szmidt and Kacprzyk proved that intuitionistic fuzzy sets are pretty useful in situations when description of a problem by a linguistic variable given in terms of a membership function only seems too rough. Coker and Saadati in 1988 [6-8] defined the notion of intuitionistic fuzzy topology and studied the basic concept of intuitionistic fuzzy point [9-10]. The concept of an ideal in topological space was first introduced by Kuratowskiin1966 and Vaidyanath swamy in 1945. They also have defined local function in an ideal topological space. Further Hamlett and Jankovic in 1990 studied the properties of an ideal topological spaces and they have introduced another operator called Ψ-operator. They have also obtained a new topology from original ideal topological space. Using the local function, they defined a Kuratowski closure operator in new topological space. The concept of supra topology was introduced by Mashhour, Allam in 1983. It is fundamental with respect to the investigation of general topological spaces. NeclaTuranl in 1999 [2] introduced the concept of intuitionistic fuzzy supra topological space. And intuitionistic fuzzy supra topological spaces are a very natural generalization of supra topological spaces. In addition to that some properties of the concept of an ideal supra topological obtained by Shyamapada and Sukalyan in 2012 [3]. In 2015 [4], further properties of an ideal supra topological spaces are investigated. In this paper we introduce the notion of intuitionistic fuzzy ideals in intuitionistic fuzzy supra topological spaces. Section-wise description of the work carried out in this paper is given below. Beginning with an introduction, necessary notation and preliminaries have been.In section 3.we introduce the concept of an intuitionistic fuzzy s-local function is also introduced here by utilizing.In section 4.we give the s-neighbourhood structure for a intuitionistic fuzzy supra topological space. These concepts are discussed with a view to find new intuitionistic fuzzy supra topologies from the original one. The basic structure, especially a basis for such generated intuitionistic fuzzy supra topologies and several relations between different intuitionistic fuzzy ideals and intuitionistic fuzzy supra topologies are also studied here. In section 5.we introduce an intuitionistic fuzzy set operator Ψ_S and study its properties.In section 6. we introduce some sets of intuitionistic fuzzy ideal supra topological spaces (intuitionistic fuzzy ∗-supra dense-in-itself sets, intuitionistic fuzzy S*-supra closed sets, intuitionistic fuzzy ∗-supra perfect sets, intuitionistic fuzzy regular-I-supra closed sets, intuitionistic fuzzy-I-supra open sets, intuitionistic fuzzy semi-I-supra open sets, intuitionistic fuzzy pre-Isupra open sets, intuitionistic fuzzy α-I-supra open sets, intuitionistic fuzzy β-I-supra open sets) and study some characteristics of theses sets. Finally, section 7.we introduce some intuitionistic fuzzy ideal supra continuous functions.

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Received 04 November 2020; **Accepted** 09 November 2020; **Published** 16 December 2020

Preliminaries

Definition 2.1. [5] Let X is a non-empty fixed set. An intuitionistic fuzzy set A is an object having the form $A = \{<x,\mu_A(x),\nu_A(x)>: x \in X\}$ where the function $\mu_A : X \longrightarrow [0,1]$ and $\nu_A: X \longrightarrow [0,1]$ denote the degree of membership (namely $\mu_A(x)$) and the degree of non-membership (namely $\nu_A(x)$) of each element $x \in X$ to the set A respectively, and $0 \le \mu_A(x) + \nu_A(x) \le 1$ for each $x \in X$.

Definition 2.2. [5] $1_\sim = \{< x,1,0>: x \in X\}$ and $0_\sim = \{< x,0,1 >: x \in X\}$.

Definition 2.3. [9] Let A and B be an intuitionistic fuzzy sets then we define

1. $A \subseteq B \Longleftrightarrow \mu_A(x) \le \mu_B(x)$ and $\nu_A(x) \ge \nu_B(x)$ for each $x \in X$,
2. $A = B \Longleftrightarrow A \subseteq B$ and $B \subseteq A$,
3. $A^c = \{<x,\nu_A(x),\mu_A(x) >: x \in X\}$,
4. $A \cap B = \{<x,\min(\mu_A(x),\mu_B(x)),\max(\nu_A(x),\nu_B(x)) >: x \in X\}$,
5. $A \cup B = \{<x,\max(\mu_A(x),\mu_B(x)),\min(\nu_A(x),\nu_B(x)) >: x \in X\}$.

Definition 2.4. [10] Let X be a non-empty set and $x \in X$ a fixed element in

X. If $\alpha \in (0,1]$ and $\beta \in [0,1)$ are two fixed rael numbers such that $\alpha+\beta \le 1$, then the intuitionistic fuzzy set

$x_{(\alpha,\beta)} = \{<x, x_\alpha, 1 - x_{1-\beta}>: x \in X\}$

is called an intuitionistic fuzzy point in X, where α denotes the degree of membership of $x_{(\alpha,\beta)}$, β the degree of non-membership of $x_{(\alpha,\beta)}$ and $x \in X$ the support of $x_{\alpha,\beta}$.

Definition 2.5. [2] A subclass $S \subseteq P(X)$ (P(X) is the collection of all intuitionistic fuzzy sets on X) is called an intuitionistic fuzzy supra topology on X if $0_\sim, 1_\sim \in S$ and S is closed under arbitrary unions (X, S) is called an intuitionistic fuzzy supra topoloical space, the members of S are called intuitionistic fuzzy supra open sets. An intuitionistic fuzzy set A is intuitionistic fuzzy supra closed if and only if its complement A^c is fuzzy supra open.

Definition 2.6. [2] Let (X, S) be an intuitionistic fuzzy supra topological space and let A be An intuitionistic fuzzy set in X. Then the intuitionistic fuzzy supra interior and the intuitionistic fuzzy supra closure of A in (X, S) defined as

$Int^S(A) = \bigcup\{U : U \subseteq A, U \in S\}$

and

$Cl^S(A) = \bigcap\{F : A \subseteq F, F^c \in S\}$

respectively.

Corollary 2.1. From Definition 2.6, $Int^S(A)$ is a fuzzy supra open set and $Cl^S(A)$ is a fuzzy supra closed set.

Definition 2.7. [10] Let A and B be two intuitionistic fuzzy sets in X. A is said to be quasi-coincident with B (written AqB) if and only if, there exists an element $x \in X$ such that $\mu_A(x) > v_B(x)$ or $v_A(x) < \mu_B(x)$.

Definition 2.8. [10] Let $x_{(\alpha,\beta)}$ an intuitionistic fuzzy point and let A an intuitionistic fuzzy set in X. We say that $x_{(\alpha,\beta)}$ quasi-coincident with A, denoted $x_{(\alpha,\beta)}qA$ if and only if $\alpha > v_A(x)$ or $\beta < \mu_A(x)$.

Definition 2.9. [10] Let $x_{(\alpha,\beta)}$ an intuitionistic fuzzy point and let A an intuitionistic fuzzy set in X. Suppose further α and β are real numbers between 0 and 1. The intuitionistic fuzzy point $x_{(\alpha,\beta)}$ is said to be properly contained in A if and only if, $\alpha < \mu_A(x)$ and $\beta > v_A(x)$.

Definition 2.10. [10] An intuitionistic fuzzy point $x_{(\alpha,\beta)}$ is said to belong to an intuitionistic fuzzy set A denoted by $x_{(\alpha,\beta)} \in A$ if $\alpha \le \mu_A(x)$ and $\beta \ge v_A(x)$.

Definition 2.11. [2] An intuitionistic fuzzy set A in an intuitionistic fuzzy supra topological space (X, S) is s-neighbourhood of an intuitionistic fuzzy point $x_{(\alpha,\beta)}$ if there is $U \in S$ with $x_{(\alpha,\beta)} \in U \subseteq A(x_{(\alpha,\beta)}qU \subseteq A)$. The collection $N(x_{(\alpha,\beta)})$ of all s-neighbourhood of $x_{(\alpha,\beta)}$ is called the s-neighbourhood system of $x_{(\alpha,\beta)}$.

Definition 2.12. [2] Let S_1 and S_2 be two intuitionistic fuzzy supra topologies on a set X such that $S_1 \subseteq S_2$. Then we say that S_2 is stronger(finer) than S_1 or S_1 is weaker(coarser) than S_2.

Definition 2.13. [2] Let (X, S) be an intuitionistic fuzzy supra topological space and $\beta \subseteq S$. Then β is called a base for the intuitionistic fuzzy supra topolgy S if every intuitionistic fuzzy supra open set $U \in S$ is a union of members of β. Equivalently, β is an intuitionistic fuzzy supra-base for S if for any intuitionistic fuzzy point $x_{(\alpha,\beta)} \in U$ there exists $B \in \beta$ with $x(\alpha,\beta) \in B \subseteq U$.

Definition 2.14. [2] A mapping c: $P(X) \longrightarrow P(X)$ is said to be an intuitionistic fuzzy supra closure operator if it satisfies the following axioms:

1. $c(0\sim) = 0\sim$,

2. $A \subseteq c(A)$ for every intuitionistic fuzzy set A in X,

3. $c(A) \cup c(B) \subseteq c(A \cup B)$ for every intuitionistic fuzzy sets A, B in X,

4. $c(c(A)) = c(A)$ for every intuitionistic fuzzy set A in X.

Theorem 2.1. [2] Let X be a non-empty set and let the mapping c: $P(X) \longrightarrow P(X)$ be an intuitionistic fuzzy supra closure operator. Then the collection $S = \{A \in P(X) : c(A^c) = A^c\}$ is intuitionistic fuzzy supra topology on X induced by the intuitionistic fuzzy supra closure operator c.

Definition 2.15. [5] A non-empty collection of intuitionistic fuzzy sets I of a set X is called intuitionistic fuzzy ideal on X if and only if

1. $A \in I$ and $B \subseteq A \Rightarrow B \in I$(heredity),
2. $A \in I$ and $B \in I \Rightarrow A \cup B \in I$(finite additivity).

Intuitionistic Fuzzy S-Local Function

Definition 3.1. An intuitionistic fuzzy supra topological space (X, S) with an intuitionistic fuzzy ideal I on X is called an intuitionistic fuzzy ideal supra topological space and denoted as (X, S, I).

Definition 3.2. Let (X, S, I) be an intuitionistic fuzzy ideal supra topology and let A be any intuitionistic fuzzy set in X. Then the intuitionistic fuzzy s-local function $A^{*S}(I,S)$ of A is the union of all intuitionistic fuzzy point $x_{(\alpha,\beta)}$ such that if $U \in N(x_{(\alpha,\beta)})$ and $A^{*S}(I,S) = \cup\{x_{(\alpha,\beta)} \in X: A \cap U \notin I$, for every $U \in N(x_{(\alpha,\beta)})\}$. We will occasionally write A^{*S} for $A^{*S}(I,S)$ and it will cause no ambiguity.

Example 3.1. The simplest intuitionistic fuzzy ideal on X are$\{0_\sim\}$ and P(X). Obviously, $I = \{0_\sim\} \Leftrightarrow A^{*S} = Cl^S(A)$, for any intuitionistic fuzzy set A in X and $I = P(X) \Leftrightarrow A^{*S} = 0_\sim$.

Theorem 3.1. Let (X, S, I) be an intuitionistic fuzzy ideal supra topological space, and let A, B be intuitionistic fuzzy subsets in X. Then,

1. $0_\sim^{*S} = 0_\sim$,

2. If $A \subseteq B$ then $A^{*S} \subseteq B^{*S}$,

3. If $I_1 \subseteq I_2$ then $A^{*S}(I_2) \subseteq A^{*S}(I_1)$,

4. $A^{*S} = Cl^S(A^{*S}) \subseteq Cl^S(A)$,

5. $(A*S)*S \subseteq A*S$,

6. A^{*S} is an intuitionistic fuzzy supra closed set,

7. $A^{*S} \cup B^{*S} \subseteq (A \cup B)^{*S}$,

8. $(A \cap B)^{*S} \subseteq A^{*S} \cap B^{*S}$,

9. IF $E \in I$ then $(A \cup E)^{*S} = A^{*S} = (A - E)^{*S}$,

10. If $U \in S$ then $U \cap A^{*S} = U \cap (U \cap A)^{*S} \subseteq (U \cap A)^{*S}$,

11. If $E \in I$ then $E^{*S} = 0_\sim$,

12. If $E \in I$, then $(1_\sim - E)^{*S} = 1_\sim^{*S}$.

Proof.1. This is clear from the definition of intuitionistic fuzzys-local function.

2. Since $A \subseteq B$, let $x_{(\alpha,\beta)} \in A^{*S}$ then $A \cap U \notin I$ for every $U \in N(x_{(\alpha,\beta)})$.

By hypothesis we get $B \cap U \notin I$, then $x_{(\alpha,\beta)} \in B$. Therefore $A^{*S} \subseteq B^{*S}$.

3. Cleary, $I_1 \subseteq I_2$ implies $A^{*S}(I_2) \subseteq A^{*S}(I_1)$, as there may be other intuitionistic fuzzy sets which belong to I_2 so that for an itutionistic fuzzy point $x(\alpha,\beta) \in A*S(I1)$ but $x(\alpha,\beta) \notin A*S(I2)$.

4. Since $\{0_\sim\} \subseteq I$ for any ituitionistic fuzzy ideal on X, therefore by (3) and Example 3.1. $A^{*S}(I) \subseteq A^{*S}(\{0_\sim\}) = Cl^S(A)$, for any intuitionistic fuzzy set A in X. Suppose, $x_{1(\alpha,\beta)} \in Cl^S(A^{*S})$ so for every $U \in N(x_{1(\alpha,\beta)})$, $A^{*S} \cap U$ 6=

$0\sim$ there exists $x_{2(\alpha,\beta)} \in A^{*S} \cap U$ such that for every $V \in N(x_{2(\alpha,\beta)})$ then $A \cap V \notin I$. Since $U \cap V \in N(x_{2(\alpha,\beta)})$ then $A \cap (U \cap V) \notin I$ which leads to $A \cap U \notin I$ for every $U \in N(x_{1(\alpha,\beta)})$ therefore $x_{1(\alpha,\beta)} \in A^{*S}$ and so $Cl^S(A^{*S}) \subseteq A^{*S}$ while the other inclusion follows directly. Hence $A^{*S} = Cl^S(A^{*S}) \subseteq Cl^S(A)$.

5. From (4), $(A^{*S})^{*S} \subseteq Cl^S(A^{*S}) = A^{*S}$.

6. Clear from (4).

7. We know that A ⊆A∪B and B ⊆A∪B. Then from (2), $A^{*S} \subseteq (A\cup B)^{*S}$ and $B^{*S} \subseteq (A \cup B)^{*S}$. Hence $A^{*S} \cup B^{*S} \subseteq (A \cup B)^{*S}$.

8. We know that (A∩ B) ⊆A and (A ∩ B) ⊆B. Then from (2), $(A \cap B)^{*S} \subseteq A^{*S}$ and $(A \cap B)^{*S} \subseteq A^{*S}$. Hence $(A \cap B)^{*S} \subseteq A^{*S} \cap B^{*S}$.

9. Since A ⊆ (A∪E), then from (2) $A^{*S} \subseteq (A\cup E)^{*S}$. Let $x_{(\alpha,\beta)} \in (A\cup E)^{*S}$. Then for every U ∈$N(x_{(\alpha,\beta)})$ such that U ∩ (A ∪E) ∈/ I. This implies that U ∩ A /∈I(If possible suppose that U ∩ A ∈I. Again U ∩ E ⊆E implies U ∩ E ∈I and hence U ∩ (A ∪E) ∈I, contradiction). Hence $x_{(\alpha,\beta)} \in A^{*S}$ and $(A \cup E)^{*S} \subseteq A^{*S}$ then $(A \cup E)^{*S} = A^{*S}$.

Since (A – E) ⊆A, then from (2), $(A - E)^{*S} \subseteq A^{*S}$. For reverse inclusion, let $x_{(\alpha,\beta)} \in A^{*S}$. We claim that $x_{(\alpha,\beta)} \in (A - E)^{*S}$, if not then there is U ∈$N(x_{(\alpha,\beta)})$ such that U ∩ (A – E) ∈I. Given that E ∈I, then E ∪(U ∩(A–E)) ∈I. This implies that E ∪(U ∩A) ∈I. So, U ∩A ∈I, a contradiction to the fact that $x_{(\alpha,\beta)} \in A^{*S}$. Hence $A^{*S} \subseteq (A - E)^{*S}$. Then $A^{*S} = (A - E)^{*S}$ therefore $(A \cup E)^{*S} = A^{*S} = (A - E)^{*S}$.

10. Since V ∩ A ⊆A, then from (2), $(V \cap A)^{*S} \subseteq A^{*S}$. So $V \cap (V \cap A)^{*S} \subseteq V \cap A^{*S}$.

11. Clear From the definition of intuitionistic fuzzy s-local function.

12. Clear from proof (9).

Theorem 3.2. Let (X, S, I) be an intuitionistic fuzzy ideal supra topological space and let A be any intuitionistic fuzzy set in X. If M ∈S,M∩ A ∈I then $M \cap A^{*S} = 0_{\sim}$.

Proof.Let x(α,β) ∈M ∩ A∗S. Then x(α,β) ∈M and x(α,β) ∈A∗S implies

U ∩ A /∈I for every U ∈$N(x_{(\alpha,\beta)})$. Since $x_{(\alpha,\beta)} \in M \in S$, then $M \cap A^{*S} \in/ I$.

Theorem 3.3. Let (X, S, I) be an intuitionistic fuzzy ideal supra topological space and let A be any intuitionistic fuzzy set in X. Then, $(A\cup A^{*S})^{*S} \subseteq A^{*S}$.

Proof.Let $x_{(\alpha,\beta)} \in/ A^{*S}$. Then there exists U ∈$N(x_{(\alpha,\beta)})$ such that U ∩ A ∈I ⇒$U \cap A^{*S} = 0_{\sim}$(By Theorem 3.2.). Hence, $U \cap (A \cup A^{*S}) = (U \cap A) \cup (U \cap A^{*S})$ = U ∩ A ∈I. Therefore, $x_{(\alpha,\beta)} \in/ (A \cup A^{*S})^{*S}$. Hence, (A ∪A∗S)∗S ⊆A∗S.

Theorem 3.4. Let (X, S, I) be an intuitionistic fuzzy ideal supra topological space. Then the operator $Cl^{*S}:P(X) \longrightarrow P(X)$ defined by $Cl^{*S}(A) = A \cup A^{*S}$ for any intuitionistic fuzzy set A in X, is an intuitionistic fuzzy supra closure operator and hence it generates intuitionistic fuzzy supra topology $S^*(I) = \{A \in P(X): Cl^{*S}(A^c) = A^c\}$ which is finer than S.

Proof.1. By Theorem 3.1.(1), $0^{*S}_{\sim} = 0_{\sim}$, we have $Cl^{*S}(0_{\sim}) = 0_{\sim}$.

2. Clear that, A ⊆$Cl^{*S}(A)$ for every intuitionistic fuzzy set A.

3. Let A, B any two intuitionistic fuzzy sets. Then, $Cl^{*S}(A) \cup Cl^{*S}(B) = (A \cup A^{*S}) \cup (B \cup B^{*S}) = (A \cup B) \cup (A^{*S} \cup B^{*S}) \subseteq (A \cup B) \cup (A \cup B)^{*S} =$

$Cl^{*S}(A\cup B)$ (by Theorem 3.1.(7)). Hence, $Cl^{*S}(A)\cup Cl^{*S}(B) \subseteq Cl^{*S}(A\cup B)$.

Let A any intuitionistic fuzzy set. Since, by (2), A ⊆$Cl^{*S}(A)$, then $Cl^{*S}(A) \subseteq Cl^{*S}(Cl^{*S}(A))$. On the other hand, $Cl^{*S}(Cl^{*S}(A)) = Cl^{*S}(A \cup A^{*S}) = (A\cup A^{*S})\cup(A\cup A^{*S})^{*S} \subseteq A\cup A^{*S}\cup A^{*S} = Cl^{*S}(A)$ (by Theorem 3.3), it follows that $Cl^{*S}(Cl^{*S}(A)) \subseteq Cl^{*S}(A)$. Hence $Cl^{*S}(Cl^{*S}(A)) = Cl^{*S}(A)$. Consequently, $Cl^{*S}(A)$ is an intuitionistic fuzzy supra closure operator. Also, it is easy to show that the collection $S^*(I) = \{A \in P(X): Cl^{*S}(A^c) = A^c\}$ is an intuitionistic fuzzy supra topology on X which is called the intuitionistic fuzzy supra topology induced by the intuitionistic fuzzy supra closure operator.

Example 3.2. For any intuitionistic fuzzy ideal on X if I = $\{0_{\sim}\}$ ⇒

$Cl^{*S}(A) = A \cup A^{*S} = A \cup Cl^S(A) = Cl^S(A)$ for every A ∈P(X). So $S^*(\{0_{\sim}\}) =$ S and if I = P(X) ⇒$Cl^{*S}(A)$ = A, because $A^{*S} = 0_{\sim}$ for every A ∈P(X). So $S^*(P(X))$ is intuitionistic fuzzy discrete supra topology on X. Since $\{0_{\sim}\}$ and P(X) are the tow extreme intuitionistic fuzzy ideal on X, therefore for any intuitionistic fuzzy ideal I on X we have $\{0_{\sim}\} \subseteq I \subseteq P(X)$. So we can conclude by Theorem 3.1.(2) $S^*(\{0_{\sim}\}) \subseteq S^*(I) \subseteq S^*(P(X))$, i.e.

S ⊆$S^*(I)$, for any intuitionistic fuzzy ideal I on X. In particular we have for any tow intuitionistic fuzzy ideals I_1 and I_2 on X, $I_1 \subseteq I_2 \Rightarrow S^*(I_1) \subseteq S^*(I_2)$.

Theorem 3.5. Let S_1,S_2 be two intuitionistic fuzzy supra topologies on X. Then for any intuitionistic fuzzy ideal I on X, $S_1 \subseteq S_2$ implies

1. $A^{*S}(S_2,I) \subseteq A^{*S}(S_1,I)$ for every A ∈P(X),

2. $S_1^*(I) \subseteq S_2^*(I)$.

Proof.1. Since every S_1 s-neighbourhood of any intuitionistic fuzzy point $x_{(\alpha,\beta)}$ is also a S_2 s-neighbourhood of $x_{(\alpha,\beta)}$. Therefore, $A^{*S}(S_2,I) \subseteq A^{*S}(S_1,I)$.

2. Clearly,$S_1^*(I) \subseteq S_2^*(I)$ as $A^{*S}(S_2, I) \subseteq A^{*S}(S_1, I)$.

Theorem 3.6. Let (X, S, I) be an intuitionistic fuzzy ideal supra topological space. Then A is intuitionistic fuzzy S^*-supra closed if and only if $A^{*S} \subseteq A$. Then $A = Cl^S(A^{*S}) = Cl^{*S}(A)$.

Proof.Clear.

Theorem 3.7. Let (X, S, I) be an intuitionistic fuzzy ideal supra topological space. Then the collection β(I,S) = {U – H: U ∈S,H ∈I} is a base for the intuitionistic fuzzy supra topology $S^*(I)$.

Proof.Let U ∈$S^*(I)$ and $x_{(\alpha,\beta)} \in U$. Then $U^c$is an intuitionistic fuzzy S^*-supra closed set so that $Cl^{*S}(U^c) = U^c$, and hence $(U^c)^{*S} \subseteq U^c$. Then $x_{(\alpha,\beta)} \in/ (U^c)^{*s}$ and so there exists V ∈$N(x_{(\alpha,\beta)})$ such that V ∩ U^c∈I. putting H = V ∩ U^c, then $x_{(\alpha,\beta)} \in/$ H and H ∈I. Thus $x_{(\alpha,\beta)} \in V - H = V \cap H^c = V \cap (V \cap H^c)^c = V \cap (V^c \cap U) = V \cap U \subseteq U$. Hence, $x_{(\alpha,\beta)} \in V - H \subseteq U$, where V – H ∈β(I,S). Hence U is the union of sets in β(I,S).

Theorem 3.8. Let (X, S, I) be an intuitionistic fuzzy ideal supra topological space. Then S ⊆β(I,S) ⊆S^*.

Proof.Let U ∈S. Then U = U $-0_{\sim}$∈β(I,S). Hence S ⊆β(I,S). Now let G ∈β(I,S) then there exists U ∈S and H ∈I such that G = U –H. Then $Cl^{*S}(G^c) = Cl^{*S}(U-H)^c = (U-H)^c\cup((U-H)^c)^{*S} = (U^c\cup H)\cup(U^c\cup H)^{*S}$. But H ∈I, then by Theorem 3.1.(8), $(U^c\cup H)^{*S} = (U^c)^{*S}$ and so, $Cl^{*S}(U - H)^c = U^c\cup H\cup(U^c)^{*S} \subseteq U^c\cup H$. Hence $Cl^{*S}(U-H)^c \subseteq U^c\cup H= (U-H)^c$, but $(U -H)^c \subseteq Cl^{*S}(U -H)^c$. Hence $Cl^{*S}(U -H)^c = (U -H)^c$. Therefore, U – H ∈$S^*(I)$. Hence β(I,S) ⊆$S^*(I)$. Consequently S ⊆β(I,S) ⊆$S^*(I)$.

Theorem 3.9. Let (X, S, I) be an intuitionistic fuzzy ideal supra topological space. Then if I = $\{0_{\sim}\}$, then S = β(I,S) = $S^*(I)$.

Proof. It following from Theorem 3.8.

Example 3.3. Let T be the intuitionistic fuzzy indiscrete supra topology on X, i.e. T = $\{0_{\sim},1_{\sim}\}$. So $1_{\sim}$is the only s-neighbourhoods of $x_{(\alpha,\beta)}$. Now, $x_{(\alpha,\beta)} \in A^{*S}$for an intuitionistic fuzzy set A if and only if for every U ∈$N(x_{(\alpha,\beta)})$ then U ∩ A /∈I. So A /∈I. Therefore $A^{*S} = 1_{\sim}$if A /∈I and

$A^{*S} = 0_{\sim}$if A ∈I. This implies that we have $Cl^{*S}(A) = A \cup A^{*S} = 1_{\sim}$if A /∈I and $Cl^{*S}(A)$ = A if A ∈I for any intuitionistic fuzzy set A of X. Hence $T^* = \{M : M^c \in I\}$. Let S ∪$T^*(I)$ be the supremum intuitionistic fuzzy supra topology of S and $T^*(I)$, i.e. the smallest intuitionistic fuzzy supra topology generated by S ∪$T^*(I)$. Then we have the following theorem.

Theorem 3.10. $S^*(I) = S \cup T^*(I)$.

Proof.Follows from the fact that β forms a basis for $S^*(I)$.

S-Compatible Intuitionistic Fuzzy Ideal

Definition 4.1. Let (X, S, I) be an intuitionistic fuzzy ideal supra topological space. We say the S is S-compatible with the intuitionistic fuzzy ideal I, denoted S ∼I, if the following holds for every intuitionistic fuzzy set A in X, if for every $x_{(\alpha,\beta)} \in A$ there exists U ∈$N(x_{(\alpha,\beta)})$ such that U ∩ A ∈I then A ∈I.

Theorem 4.1. Let (X, S, I) be an intuitionistic fuzzy ideal supra topological space, the following properties are equivalent;

1. S ∼I,

2. For every intuitionistic fuzzy set A in X, $A \cap A^{*S} = 0_{\sim}$ implies that A ∈I,

3. For every intuitionistic fuzzy set A in X, $A - A^{*S} \in I$, *4.* For every intuitionistic fuzzy set A in X, if A contains no empty intuitionistic fuzzy subset B with B ⊆B^{*S}, then A ∈I.

Proof.(1) ⇒ (2) The proof is obvious.

(2) ⇒ (3) For any intuitionistic fuzzy set A in X, A – A^{*S} ⊆A and (A – A^{*S}) ∩ $(A – A^{*S})^{*S}$ ⊆ (A – A^{*S}) ∩ A^{*S} = 0∼. By (2), A – A^{*S} ∈I.

(3) ⇒ (4) By (3), for every intuitionistic fuzzy set A in X, A – A^{*S} ∈I.

Let A – A^{*S} = E ∈I, then A = E ∪ (A ∩ A^{*S}) and by Theorem 3.1.(6) A∗S ⊆E∗S ∪(A∩A∗S)∗S = (A∩A∗S)∗S and A∩A∗S ⊆A then (A∩A∗S)∗S ⊆

A^{*S} therefore A^{*S} = $(A ∩ A^{*S})^{*S}$, we have A ∩ A^{*S} = A ∩ $(A ∩ A^{*S})^{*S}$ ⊆ $(A∩A^{*S})^{*S}$ and A∩A^{*S} ⊆A. By the assumption A∩A^{*S} = $0_\sim$ and hence A = A – A^{*S} ∈I.

⇒ (1) Let A intuitionistic fuzzy set in X and assume that for every $x_{(\alpha,\beta)}$, there exists U ∈N($x_{(\alpha,\beta)}$) such that U ∩A ∈I. Then A∩A^{*S} = $0_\sim$. Suppose that A contains B such that B ⊆B^{*S}. Then B = B ∩ B^{*S} ⊆A∩A^{*S} = $0_\sim$, Therefore, A contains no nonempty subset B with B ⊆B^{*S}. Hence A ∈I.

Theorem 4.2. Let (X, S, I) be an intuitionistic fuzzy ideal supra topological space. If S is S-compatible with I, then the following equivalent properties hold;

1. For every intuitionistic fuzzy set A in X, A ∩ A^{*S} = $0_\sim$ implies that A∗S = 0∼,

2. For every intuitionistic fuzzy set A in X, $(A – A^{*S})^{*S}$ = $0_\sim$.

Proof.First, we show that (1) holds if S is S-compatible with I. Let A be any intuitionistic fuzzy set in X and A∩ A^{*S} = $0_\sim$. By Theorem 4.1.A ∈I then A^{*S} = 0∼.

(1) ⇒ (2) Assume that for every intuitionistic fuzzy set A in X, A∩A^{*S} = $0_\sim$ implies that A^{*S} = $0_\sim$. Let B = A–A^{*S}, then B ∩B^{*S} = (A–A^{*S})∩(A– A∗S)∗S = (A∩(A∗S)c)∩(A∩(A∗S)c)∗S ⊆ ((A∩(A∗S)c)∩(A∗S)∩((A∗S)c)∗S) = 0∼. By (1), we have B^{*S} = 0∼. Hence $(A – A^{*S})^{*S}$ = 0∼.

⇒ (1) Assume that for every intuitionistic fuzzy set A in X, A∩A^{*S} = $0_\sim$ and let B = A – A^{*S} then A = B ∪ (A ∩ A^{*S}) = B ∪ $0_\sim$ = B then A∗S = B∗S = (A – A∗S)∗S = 0∼.

Theorem 4.3. Let (X, S, I) be an intuitionistic fuzzy ideal supra topological space, then the following properties are equivalent;

1. S ∩ I = $0_\sim$,

2. $1_\sim^{*S} = 1_\sim$.

Proof.(1) ⇒ (2) Let S ∩ I = $0_\sim$. Then $1_\sim^{*S} = Cl^S(1_\sim) = 1_\sim$.

(2) ⇒ (1) $1_\sim = 1_\sim^{*S} = \{x_{(\alpha,\beta)} \in X : U \cap 1_\sim = U \notin I$ for every U ∈N($x_{(\alpha,\beta)}$)}. Hence Cl^S(S) ∩ I = 0∼.

Some Sets of Intuitionistic Fuzzy Ideal Supra Topological Space

Definition 5.1. Let (X, S, I) be an intuitionistic fuzzy ideal supra topological space and A be any intuitionistic fuzzy set in X. Then A is said to be

1. Intuitionistic fuzzy ∗-supra dense-in-itself set if A ⊆A^{*S},

2. Intuitionistic fuzzy S^*-supra closed set if A^{*S} ⊆A,

3. Intuitionistic fuzzy ∗-supra prefect set if A = A^{*S},

4. Intuitionistic fuzzy regular-I-supra closed set if A = $(Int^S(A))^{*S}$.

Theorem 5.1. Let (X, S, I) be an intuitionistic fuzzy ideal supra topological space. Then the following statements hold;

1. Every intuitionistic fuzzy regular-I-supra closed set is intuitionistic fuzzy∗-supra prefect set,

2. Every intuitionistic fuzzy ∗-supra prefect set is intuitionistic fuzzy S^*supra closed set,

3. Every intuitionistic fuzzy ∗-supra prefect set is intuitionistic fuzzy ∗supra dense-in-itself set.

Proof.1. Let A be an intuitionistic fuzzy regular-I-supra closed set. Then, we have A = $(Int^S(A))^{*S}$. Since Int^S(A) ⊆A by Theorem 3.1.(2) then $(Int^S(A))^{*S}$ ⊆A^{*S}. Then we have A = $(Int^S(A))^{*S}$ ⊆A^{*S}. Since A = $(Int^S(A))^{*S}$ then A^{*S} = $((Int^S(A))^{*S})^{*S}$ ⊆ $(Int^S(A))^{*S}$ = A. Therefore, we obtain A = A^{*S}. This shows that A is intuitionistic fuzzy ∗-supra prefect set.

2. Let A be an intuitionistic fuzzy ∗-supra perfect set. Then we have A = A^{*S} therefore, we obtain A^{*S} ⊆A. This shows that A is intuitionistic fuzzy S^*-supra closed set.

Let A be an intuitionistic fuzzy ∗-supra perfect set. Then we have A = A^{*S} therefore, we obtain A ⊆A^{*S}. This shows that A is intuitionistic fuzzy ∗-supra dense-in-itself set.

Remark 5.1. The converses of Theorem 5.1, need not be true as the following examples show.

Example 5.1. Let X={a, b, c} and A, B be intuitionistic fuzzy sets in X defined as follows;

A = {< a,0.3,0.6 >,< b,0.7,0.2 >,< c,0.5,0.3 >}

B = {< a,0.6,0.3 >,< b,0.2,0.7 >,< c,0.3,0.5 >}

We put S = {$0_\sim$,$1_\sim$,A}. If we take I = {$0_\sim$} then B is intuitionistic fuzzy ∗-supra perfect set but not intuitionistic fuzzy regular-I-supra closed set.

Example 5.2. Let X={a, b, c} and A, B be intuitionistic fuzzy sets in X defined as follows;

A = {< a,0.1,0.6 >,< b,0.4,0.5 >,< c,0.2,0.7 >}

B = {< a,0.3,0.5 >,< b,0.6,0.4 >,< c,0.3,0.5 >}

We put S = {$0_\sim$,$1_\sim$,A}. If we take I = P(X) then B is intuitionistic fuzzy S^*-supra closed set but not intuitionistic fuzzy ∗-supra perfect set.

Example 5.3. In Example 5.1, A is intuitionistic fuzzy ∗-supra dense-initself set but not intuitionistic fuzzy ∗-supra perfect set.

Definition 5.2. Let (X, S, I) be an intuitionistic fuzzy ideal supra topological space and A be any intuitionistic fuzzy set in X. Then A is said to be

1. Intuitionistic fuzzy-I-supra open set if A ⊆$Int^S(A^{*S})$,

2. Intuitionistic fuzzy semi-I-supra open set if A ⊆$Cl^{*S}(Int^S(A))$,

3. Intuitionistic fuzzy pre-I-supra open set if A ⊆$Int^S(Cl^{*S}(A))$, 4. Intuitionistic fuzzy α-I-supra open set if A ⊆$Int^S(Cl^{*S}(Int^S(A)))$,

5. Intuitionistic fuzzy β-I-supra open set if A ⊆$Cl^S(Int^S(Cl^{*S}(A)))$.

An intuitionistic fuzzy set A of an intuitionistic fuzzy ideal supra topological space (X, S, I) is said to be intuitionistic fuzzy-I-closed set (resp. intuitionistic fuzzy semi-I-supra closed set, intuitionistic fuzzy pre-I-supra closed set, intuitionistic fuzzy α-I-supra closed set, intuitionistic fuzzy β-I-supra closed set) if its complement is intuitionistic fuzzy-I-open set (resp. intuitionistic fuzzy semi-I-supra open set, intuitionistic fuzzy pre-I-supra open set, intuitionistic fuzzy α-I-supra open set, intuitionistic fuzzy β-I-supra open set).

Theorem 5.2. Let (X, S, I) be an intuitionistic fuzzy ideal supra topological space. Then the following statements hold;

1. Every intuitionistic fuzzy supra open set is fuzzy α-I-supra open set,

2. Every intuitionistic fuzzy-I-supra open set is fuzzy pre-I-supra openset,

3. Every intuitionistic fuzzy α-I-supra open set is intuitionistic fuzzy semiI-supa open set,

4. Every intuitionistic fuzzy α-I-supra open set is intuitionistic fuzzy preI-supra open set, *5.* Every intuitionistic fuzzy semi-I-supra open set is intuitionistic fuzzyβ-I-supra open set,

6. Every intuitionistic fuzzy pre-I-supra open set is intuitionistic fuzzyβ-I-supra open set.

Proof.1. Let A be an intuitionistic fuzzy supra open set. Then, we have A = $Int^S(A)$ since, A $\subseteq Int^S(A) \subseteq Cl^{*S}(Int^S(A))$. But An intuitionistic fuzzy supra open set then A = $Int^S(A) \subseteq Int^S(Cl^{*S}(Int^S(A)))$. This shows that A is intuitionistic fuzzy α-I-supra open set.

2. Let A be an intuitionistic fuzzy-I-supra open set. Then, we have A $\subseteq Int^S(A^{*S})$, but $A^{*S} \subseteq Cl^{*S}(A)$, then A $\subseteq Int^S(Cl^{*S}(A))$. This shows that A is intuitionistic fuzzy pre-I-supra open set.

3. Let A be an intuitionistic fuzzy α-I-supra open set. Then, we have A $\subseteq Int^S(Cl^{*S}(Int^S(A))) \subseteq Cl^{*S}(Int^S(A))$. This shows that A is intuitionistic fuzzy semi-I-supra open set.

4. Let A be an intuitionistic fuzzy α-I-supra open set. Then, we have A $\subseteq Int^S(Cl^{*S}(Int^S(A))) \subseteq Int^S(Cl^{*S}(A))$. This shows that A is intuitionistic fuzzy pre-I-supra open set.

5. Let A be an intuitionistic fuzzy semi-I-supra open set. Then, we have A $\subseteq Cl^{*S}(Int^S(A)) \subseteq Cl^S(Int^S(Cl^{*S}(A)))$. This shows that A is intuitionistic fuzzy β-I-supra open set.

Let A be an intuitionistic fuzzy pre-I-supra open set. Then, we have A $\subseteq Int^S(Cl^{*S}(A)) \subseteq Cl^S(Int^S(Cl^{*S}(A)))$. This shows that A is intuitionistic fuzzy β-I-supra open set.

Remark 5.2. The converses of Theorem 5.2, need not be true as the following examples show.

Example 5.4. In Example 5.2. B is fuzzy α-I-supra open set, but not fuzzy supra open set.

Example 5.5. In Example 5.2. A is fuzzy pre-I-supra open set, but not fuzzy-I-supra open set.

Example 5.6. Let X = {a,b,c} and A, B, C be an intuitionistic fuzzy sets in X defined as follows;

A = {< a,0.7,0.3 >,< b,0.4,0.5 >,< c,0.5,0.5 >}

B = {< a,0.2,0.8 >,< b,0.3,0.7 >,< c,0.4,0.6 >}

C = {< a,0.8,0.2 >,< b,0.7,0.3 >,< c,0.6,0.4 >}

We put S = $\{0_\sim,1_\sim,B\}$. If we take I = $\{0_\sim\}$ then A is intuitionistic fuzzy semi-I-supra open set but not intuitionistic fuzzy α-I-supra open set.

Example 5.7. In Example 5.6, If we put S = $\{0_\sim,1_\sim,A\}$ and we take I = $\{0_\sim\}$ then C is intuitionistic fuzzy pre-I-supra open set but not intuitionistic fuzzy α-I-supra open set.

Example 5.8. In Example 5.1. B is intuitionistic fuzzy β-I-supra open set, but not intuitionistic fuzzy semi-I-supra open set.

Example 5.9. Let X = {a,b,c} and A, B, C be an intuitionistic fuzzy sets in X defined as follows;

A = {< a,0.7,0.3 >,< b,0.4,0.5 >,< c,0.2,0.5 >}

B = {< a,0.9,0.1 >,< b,0.8,0.2 >,< c,0.7,0.3 >}

C = {< a,0.1,0.9 >,< b,0.2,0.8 >,< c,0.3,0.7 >}

We put S = $\{0_\sim,1_\sim,A,C,A\cup C\}$. If we take I = $\{0_\sim\}$ then B is intuitionistic fuzzy β-I-supra open set but not intuitionistic fuzzy pre-I-supra open set.

Theorem 5.3. Let (X, S, I) be an intuitionistic fuzzy ideal supra topological space and A be any intuitionistic fuzzy set in X. If A is intuitionistic fuzzy regular-I-supra closed set then A is intuitionistic fuzzy semi-I-supra open set.

Proof. Let A intuitionistic fuzzy regular-I-supra closed set then we have A = $(Int^S(A))^{*S} \subseteq (Int^S(A))^{*S} \cup Int^S(A) = Cl^{*S}(Int^S(A))$.This shows that A is intuitionistic fuzzy semi-I-supra open set.

Remark 5.3. The converses of Theorem.5.3, need not be true as the following example show.

Example 5.10. In Example.5.9. A is intuitionistic fuzzy semi-I-supra open set, but not intuitionistic fuzzy regular-I-supra closed set.

Some Intuitionistic Fuzzy Ideal Supra Continuous Function

Definition 6.1. A function f : (X,S,I) → (Y,ϕ) is said to be intuitionistic fuzzy ∗-supra perfectly continuous (resp. intuitionistic fuzzy regular-I-supra closed continuous, intuitionistic fuzzy contra ∗-supra continuous) if for every V ∈ϕ,$f^{-1}(V)$ is intuitionistic fuzzy ∗-supra perfect (resp. intuitionistic fuzzy regular-I-supra closed, intuitionistic fuzzy S^*-supra closed) set of (X, S, I).

Theorem 6.1. For a function f : (X,S,I) → (Y,ϕ) the following statements hold;

1. Every intuitionistic fuzzy regular-I-supra closed continuous is intuitionistic fuzzy ∗-supra perfectly continuous,

2. Every intuitionistic fuzzy ∗-supra perfectly continuous is intuitionistic fuzzy contra ∗-supra continuous.

Proof.This follows from Theorem.5.1, and Definition.6.1.

Remark 6.1. The converses of Theorem.6.1, need not be true as shown in the following examples.

Example 6.1. Let X = {a,b,c},Y = {x,y,z} and A, B be intuitionistic fuzzy supra subsets defined as follows;

A = {< a,0.7,0.3 >,< b,0.4,0.6 >,< c,0.8,0.2 >}

B = {< x,0.3,0.7 >,< y,0.6,0.4 >,< z,0.2,0.8 >}

Let S = $\{0_\sim,1_\sim,A\}$,ϕ = $\{0_\sim,1_\sim,B\}$ and I = $\{0_\sim\}$. Then the function f : (X,S,I) → (Y,ϕ) defined by f(a) = x,f(b) = y and f(c) = z then f is intuitionistic fuzzy ∗-supra perfectly continuous but not intuitionistic fuzzy regular-I-supra closed continuous.

Example 6.2. Let X = {a,b,c},Y = {x,y,z} and A, B be intuitionistic fuzzy supra subsets defined as follows;

A = {< a,0.8,0.2 >,< b,0.2,0.4 >,< c,0.4,0.5 >}

B = {< x,0.9,0.1 >,< y,0.4,0.5 >,< z,0.7,0.2 >}

Let S = $\{0_\sim,1_\sim,A\}$,ϕ = $\{0_\sim,1_\sim,B\}$ and I = $\{0_\sim\}$. Then the function f : (X,S,I) → (Y,ϕ) defined by f(a) = x,f(b) = y and f(c) = z then f is intuitionistic fuzzy contra ∗-supra continuous but not intuitionistic fuzzy ∗-supra perfectly continuous.

Definition 6.2. A function f : (X,S,I) → (Y,ϕ) is said to be intuitionistic fuzzy-I-supra continuous (resp. intuitionistic fuzzy semi-I-supra continuous, intuitionistic fuzzy pre-I-supra continuous, intuitionistic fuzzy αI-supra continuous, intuitionistic fuzzy β-I-supra continuous) if for every V ∈ϕ,$f^{-1}(V)$ is intuitionistic fuzzy-I-supra open (resp. intuitionistic fuzzy semi-I-supra open, intuitionistic fuzzy pre-I-supra open, intuitionistic fuzzy α-I-supra open, intuitionistic fuzzy β-I-supra open) set of (X, S, I).

Theorem 6.2. For a function f : (X,S,I) → (Y,ϕ) the following statements hold;

1. Every intuitionistic fuzzy supra continuous is intuitionistic fuzzy α-Isupra continuous,

2. Every intuitionistic fuzzy-I-supra continuous is intuitionistic fuzzy preI-supra continuous,

3. Every intuitionistic fuzzy α-I-supra continuous is intuitionistic fuzzy semi-I-supra continuous, *4.* Every intuitionistic fuzzy α-I-supra continuous is intuitionistic fuzzy pre-I-supra continuous,

5. Every intuitionistic fuzzy semi-I-supra continuous is intuitionistic fuzzyβ-I-supra continuous,

6. Every intuitionistic fuzzy pre-I-supra continuous is intuitionistic fuzzyβ-I-supra continuous.

Proof.This follows from Theorem.5.2, and Definition.6.2.

Remark 6.2. The converses of Theorem.6.2, need not be true as shown in the following examples.

Example 6.3. In Example.6.2.f is intuitionistic fuzzy α-I-supra continuous but not intuitionistic fuzzy supra continuous.

Example 6.4. In Example.6.2. If we take I = P(X), then f is intuitionistic fuzzy pre-I-supra continuous but not intuitionistic fuzzy-I-supra continuous.

Example 6.5. Let X = {a,b,c},Y = {x,y,z} and A, B be intuitionistic fuzzy supra subsets defined as follows;

A = {< a,0.4,0.6 >,< b,0.1,0.9 >,< c,0.2,0.8 >}

B = {< x,0.6,0.4 >,< y,0.9,0.1 >,< z,0.8,0.2 >}

Let S = $\{0_\sim,1_\sim,A\}$,ϕ = $\{0_\sim,1_\sim,B\}$ and I = $\{0_\sim\}$. Then the function f : (X,S,I) ⟶ (Y,ϕ) defined by f(a) = x,f(b) = y and f(c) = z then f is intuitionistic fuzzy semi-I-supra continuous and intuitionistic fuzzy pre-Isupra continuous but not intuitionistic fuzzy α-I-supra continuous.

Example 6.6. In Example.6.1.f is intuitionistic fuzzy β-I-supra continuous but not intuitionistic fuzzy semi-I-supra continuous.

Example 6.7. In Example.6.5. If we take I = P(X), then f is intuitionistic fuzzy β-I-supra continuous but not intuitionistic fuzzy pre-I-supra continuous.

Theorem 6.3. Let (X, S, I) be an intuitionistic fuzzy ideal supra topological space and A be any intuitionistic fuzzy set in X. If A is intuitionistic fuzzy regular-I-supra closed set then A is intuitionistic fuzzy semi-I-supra open set.

Proof.This follows from Theorem.5.3, Definition.6.1, and Definition.6.2.
Remark 6.3. The converses of Theorem.6.3, need not be true as the following example show.

Example 6.8. In Example.6.5. A is intuitionistic fuzzy semi-I-supra continuous but not intuitionistic fuzzy regular-I-supra closed continuous.

Conclusion

The present paper is focused on the notion of intuitionistic fuzzy ideals in intuitionistic fuzzy supra topological spaces. The concept of an intuitionistic fuzzy s-local function is also introduced here by utilizing the neighborhood structure for a intuitionistic fuzzy supra topological space. These concepts are discussed with a view to find new intuitionistic fuzzy supra topologies from the original one. The basic structure, especially a basis for such generated intuitionistic fuzzy supra topologies and several relations between different intuitionistic fuzzy ideals and intuitionistic fuzzy supra topologies are also studied here. Moreover, we introduce an intuitionistic fuzzy set operator Ψ_s and study its properties. Finally, we introduce some sets of intuitionistic fuzzy ideal supra topological spaces (intuitionistic fuzzy ∗-supra dense-in-itself sets, intuitionistic fuzzy S*-supra closed sets, intuitionistic fuzzy ∗-supra perfect sets, intuitionistic fuzzy regular-I-supra closed sets, intuitionistic fuzzy-I-supra open sets, intuitionistic fuzzy semi-Isupra open sets, intuitionistic fuzzy pre-I-supra open sets, intuitionistic fuzzy α-I-supra open sets, intuitionistic fuzzy β-I-supra open sets) and study some characteristics of theses sets and then we introduce some intuitionistic fuzzy ideal supra continuous functions.

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How to cite this article: Fadhil Abbas. Intuitionistic Fuzzy Ideals Supra Topological Spaces. *J Appl Computat Math* 9 (2020) doi: 10.37421/jacm.2020.9.462