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On intuitionistic fuzzy contra λ-closed mappings

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Abstract. The aim of this paper is to introduce and study the concepts of intuitionistic fuzzy contra λ-closed mappings in intuitionistic fuzzy topological space and obtain some of their basic properties.

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Keywords: Intuitionistic fuzzy topology, Intuitionistic fuzzy λ-closed set, Intuitionistic fuzzy $\lambda-$open set, Intuitionistic fuzzy contra λ-closed maps, Intuitionistic fuzzy contra λ-open maps.

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1. Introduction

The concept of intuitionistic fuzzy set was introduced by Atanassov [1] in 1983 as a generalised of fuzzy sets. This approach provided a wide field to the generalization of various concepts of fuzzy mathematics. In 1997 coker [2] defined intuitionistic fuzzy topological spaces. Recently many concepts of fuzzy topological space have been extended in intuitionistic fuzzy (IF) topological space. We provide some characterizations of intuitionistic fuzzy contra λ-closed mappings and intuitionistic fuzzy contra λ-open mappings and establish the relationships with other classes of early defined forms of intuitionistic mappings.

2. Preliminaries

Definition 2.1 ([1]). Let X be a nonempty fixed set. An intuitionistic fuzzy set (IFS) A in X is an object having the form $A = \{\langle x, \mu_A(x), \nu_A(x)\rangle : x \in X\}$, where the function $\mu_A : X \to [0, 1]$ and $\nu_A : X \to [0, 1]$ denotes the degree of membership $\mu_A(x)$ and the degree of non membership $\nu_A(x)$ of each element $x \in X$ to the set A respectively and $0 \leq \mu_A(x) + \nu_A(x) \leq 1$ for each $x \in X$.

Definition 2.2 ([1]). Let A and B be intuitionistic fuzzy sets of the form $A = \{\langle x, \mu_A(x), \nu_A(x)\rangle : x \in X\}$, and form $B = \{\langle x, \mu_B(x), \nu_B(x)\rangle : x \in X\}$. Then

(a) $A \subseteq B$ if and only if $\mu_A(x) \leq \mu_B(x)$ and $\nu_A(x) \geq \nu_B(x)$ for all $x \in X$

(b) $A = B$ if and only if $A \subseteq B$ and $B \subseteq A$
(c) $A^c = \{\langle x, \nu_A(x), \mu_A(x)\rangle / x \in X\}$
(d) $A \cap B = \{\langle x, \mu_A(x) \wedge \mu_B(x), \nu_A(x) \vee \nu_B(x)\rangle / x \in X\}$
(e) $A \cup B = \{\langle x, \mu_A(x) \vee \mu_B(x), \nu_A(x) \wedge \nu_B(x)\rangle / x \in X\}$.

The intuitionistic fuzzy sets $\underset{\sim}{0} = \{\langle x, 0, 1\rangle / x \in X\}$ and $\underset{\sim}{1} = \{\langle x, 1, 0\rangle / x \in X\}$ are respectively the empty set and whole set of X.

Definition 2.3 ([2]).) An intuitionistic fuzzy topology (IFT) on X is a family of IFS which satisfying the following axioms.

(i) $\underset{\sim}{0}, \underset{\sim}{1} \in \tau$
(ii) $G_1 \cap G_2 \in \tau$ for any $G_1, G_2 \in \tau$
(iii) $\cup G_i \in \tau$ for any family $\{Gi/i \in I\} \subseteq \tau$

In this paper the pair (X, τ) is called an intuitionistic fuzzy topological space (IFTS) and each intuitionistic fuzzy set in τ is known as an intuitionistic fuzzy open set (IFOS) in X.

Definition 2.4 ([2]). The complement A^c of an intuitionistic fuzzy open set A in an intuitionistic fuzzy topological space (X, τ) is called intuitionistic fuzzy closed set in X.

Definition 2.5 ([2]). Let (X, τ) be an intuitionistic fuzzy topological space and $A = \{\langle x, \mu_A(x), \nu_B(x)\rangle : x \in X\}$, be an intuitionistic fuzzy set in X. Then the intuitionistic fuzzy interior and intuitionistic fuzzy closure are defined by
$int(A)$=$\cup\{G/G$ is an intuitionistic fuzzy open set in X and $G \subseteq A\}$
$cl(A)$=$\cap\{K/K$ in an intuitionistic fuzzy closed set in X and $A \subseteq K\}$

Remark 2.6 ([4]). For any intuitionistic fuzzy set A in (X, τ), we have

(i) $cl(A^c) = [int(A)]^c$,
(ii) $int(A^c) = [cl(A)]^c$,
(iii) A is an intuitionistic fuzzy closed set in $X \Leftrightarrow cl(A) = A$
(iv) A is an intuitionistic fuzzy open in $X \Leftrightarrow int(A) = A$

Definition 2.7. Let (X, τ) be an IFTS and IFS $A = \{\langle x, \mu_B(x), \nu_B(x)\rangle : x \in X\}$ is said to be an

(a) intuitionistic fuzzy semi closed set [3] (IFSCS in short) if $int(cl(A)) \subseteq A$,
(b) intuitionistic fuzzy α-closed set [3] (IF α-CS in short) if $cl(int(cl(A))) \subseteq A$,
(c) intuitionistic fuzzy pre-closed set [3] (IFPCS in short) if $cl(int(A)) \subseteq A$,
(d) intuitionistic fuzzy regular closed set [3] (IFRCS in short) if $cl(int(A)) = A$,
(e) intuitionistic fuzzy generalized closed set [9] (IFGCS in short) if $cl(A) \subseteq U$, whenever $A \subseteq U$, and U in an IFOS,
(f) intuitionistic fuzzy generalized semi closed set [8] (IFGSCS in short) if $cl(A) \subseteq U$, whenever $A \subseteq U$, and U is an IFOS,
(g) intuitionistic fuzzy α-generalized closed set [7] (IF α-GCS in short) if α-$cl(A) \subseteq U$, whenever $A \subseteq U$, and U is an IFOS.

An IFS A is called intuitionistic fuzzy semi open set, intuitionistic fuzzy α-open set, intuitionistic fuzzy pre open set, intuitionistic fuzzy regular open set, intuitionistic fuzzy generalized open set, intuitionistic fuzzy generalized semi open set, and intuitionistic fuzzy α-generalized open set and (IFSOS, IF α-OS, IFPOS, IFROS, IFGOS, IFGSOS, IF α-GOS and) if the complement A^c is an IFSCS, IF α-CS, IFPCS, IFRCS, IFGCS, IFGSCS, and IF α-GCS, respectively.

Definition 2.8 ([2])**.** Let X and Y are nonempty sets and $f : X \to Y$ is a function.

(a) If $B = \{\langle y, \mu_B(y), \nu_B(y)\rangle : y \in Y\}$ is an intuitionistic fuzzy set in Y, then the pre image of B under f denoted by $f^{-1}(B)$ is defined by $f^{-1}(B) = \{\langle x, f^{-1}(\mu_B(x)), f^{-1}(\nu_B(x))\rangle : x \in X\}$

(b) If $A = \{\langle x, \mu_A(x), \nu_B(x)\rangle : x \in X\}$ is an intuitionistic fuzzy set in X, the image of A under f denoted by $f(A)$ is the intuitionistic fuzzy set in Y defined by $f(A) = \{\langle y, f(\mu_A(y)), f(\nu_A(y))\rangle : y \in Y\}$ where $f(\nu_A) = 1 - f(1 - \nu_A)$.

Definition 2.9 ([5])**.** An intutionistic fuzzy set A of an intuitionistic topology space (X, τ) is called an

(i) intuitionistic fuzzy λ-closed set (IF λ-CS) if $A \supseteq cl(U)$ whenever $A \supseteq U$ and U is intuitionistic fuzzy open set in X.

(ii) intuitionistic fuzzy λ-open set (IF λ-OS) if the complement A^c of an intuitionistic fuzzy λ-closed set in A.

Definition 2.10 ([6])**.** Let A be an IFS in an IFTS (X, τ). Then the intuitionistic fuzzy λ-interior and intuitionistic fuzzy λ-closure of A are defined as follows
$\lambda - int(A)$=$\cup\{G/G$ is an IF $\lambda-$OS in X and $G \subseteq A$ $\}$
$\lambda - cl(A)$=$\cap\{K/K$ is an IF $\lambda-$CS in X and $A \subseteq K\}$

Definition 2.11. [6] A mapping $f : (X, \tau) \to (Y, \sigma)$ is called an intuitionistic fuzzy λ-continuous if $f^{-1}(V)$ is an intuitionistic fuzzy λ-closed sets in (X, τ) for every IFCS V of (Y, σ).

The family of all intuitionistic fuzzy λ-closed set (intuitionistic fuzzy λ-open set) of an IFTS (X, τ) is denoted by IF λ-CS(X) (IF λ-OS(X)).
Throughout this paper $f : (X, \tau) \to (Y, \sigma)$ denotes a mapping from an intuitionistic fuzzy topological space (X, τ) to another intuitionistic topological space (Y, σ).

Definition 2.12. A mapping $f : (X, \tau) \to (Y, \sigma)$ from an IFTS (X, τ) into an IFTS (Y, σ) is said to be an

(a) [7] intuitionistic fuzzy closed mapping (IFCM for short) if $f(A)$ is an IFCS in Y for every IFCS A in X.

(b) [3] intuitionistic fuzzy semi closed mapping (IFSCM for short) if $f(A)$ is an IFSCS in Y for every IFCS in X.

(c) [3] intuitionistic fuzzy pre-closed mapping (IFPCM for short) if $f(A)$ is an IFPCS in Y for every IFCS A in X.

(d) [3] intuitionistic fuzzy α-closed mapping (IF α CM for short) if $f(A)$ is an IFαCS in Y for every IFCS A in X.

(e) [3] intuitionistic fuzzy α-generalized closed mapping (IFαGCM for short) if $f(A)$ is an IFαGCS in Y for every IFCS A in X.

Definition 2.13. A mapping $f : (X, \tau) \to (Y, \sigma)$ from an IFTS (X, τ) into an IFTS (Y, σ) is said to be an

(a) [3] intuitionistic fuzzy contra closed map (IF contra closed map in short) if $f(A)$ is an IFOS in Y for every IFCS A in X.
(b) [3] intuitionistic fuzzy contra α-closed map (IFcα closed map in short) if $f(A)$ is an IFαOS in Y for every IFCS A in X.
(c) [9] intuitionistic fuzzy contra generalized closed map (IFcG closed map in short) if $f(A)$ is an IFGOS in Y for every IFCS A in X.
(d) [9] intuitionistic fuzzy contra generalized semi closed map (IFcGS closed map in short) if $f(A)$ is an IFGSOS in Y for every IFCS A in X.

3. Intuitionistic fuzzy contra λ-closed mappings

In this section, we introduce intuitionistic fuzzy contra λ-closed mappings and study some of their properties.

Definition 3.1. A mapping $f : (X, \tau) \to (Y, \sigma)$ is said to be intuitionistic fuzzy contra λ-closed mapping if $f(A)$ is an IF λ-CS in (Y, σ) for every IFOS A in (X, τ).

Example 3.2. Let $X = \{a, b\}$ and $Y = \{u, v\}$ and $U = \{\langle x, 0.5, 0.5\rangle, \langle y, 0.3, 0.6\rangle\}$, $V = \{\langle u, 0.5, 0.5\rangle, \langle v, 0.8, 0.2\rangle\}$. Then, $\tau = \{\underset{\sim}{0}, \underset{\sim}{1}, U\}$ and $\sigma = \{\underset{\sim}{0}, \underset{\sim}{1}, V\}$ be intuitionistic fuzzy topologies of X and Y, respectively. Consider a mapping $f : (X, \tau) \to (Y, \sigma)$ by $f(a) = u$ and $f(b) = v$. This f is an intuitionistic fuzzy contra λ-closed mapping.

Theorem 3.3. *Every intuitionistic fuzzy contra closed mapping is an intuitionistic fuzzy contra λ-closed mapping but not conversely.*

Proof. Let $f : (X, \tau) \to (Y, \sigma)$ be an intuitionistic fuzzy contra mappings. Let A be an IFOS in X. By hypothesis, $f(A)$ is an IFCS in Y. Since every IFCS is an IF λ-CS in Y [5]. Therefore, $f(A)$ is IFCS in an IF λ-CS in Y. Hence, f is an intuitionistic fuzzy contra λ-mappings is closed mappings. □

Converse of the above theorem is not true as seen from the following example:

Example 3.4. Let $X = \{a, b\}$ and $Y = \{u, v\}$ and $U = \{\langle x, 0.5, 0.5\rangle, \langle y, 0.3, 0.6\rangle\}$, $V = \{\langle u, 0.5, 0.5\rangle, \langle v, 0.8, 0.2\rangle\}$. Then, $\tau = \{\underset{\sim}{0}, \underset{\sim}{1}, U\}$ and $\sigma = \{\underset{\sim}{0}, \underset{\sim}{1}, V\}$ be intuitionistic fuzzy topologies of X and Y, respectively. Consider a mapping $f : (X, \tau) \to (Y, \sigma)$ by $f(a) = u$ and $f(b) = v$. Hence, f is an intuitionistic fuzzy contra λ-closed mapping but not an intuitionistic fuzzy contra closed mapping, since U is an IFOS in X but $f(U) = \{\langle u, 0.5, 0.5\rangle, \langle v, 0.3, 0.6\rangle\}$ is not an IF λ-CS in Y.

Theorem 3.5. *Let $f : (X, \tau) \to (Y, \sigma)$ be an intuitionistic fuzzy contra λ-mappings and Y is an IF λ-$T_{1/2}$ space. Then f is an intuitionistic fuzzy contra mapping.*

Proof. Let A be an IFOS in X. By hyothesis, $f(A)$ is an IFλ-CS in X. Since Y is an IF λ-$T_{1/2}$ space, $f(A)$ is an IFCS in X. Hence f is an an intuitionistic fuzzy contra mapping. □

Theorem 3.6. *Let $f : (X, \tau) \to (Y, \sigma)$ be a mapping from an IFTS X into an IFTS Y and Y is IF λ-$T_{1/2}$ space. Then the following statements are equivalent.*
(a) *f is an intuitionistic fuzzy contra λ-closed mapping,*
(b) *f is an intuitionistic fuzzy contra mapping.*

Proof. Obvious. □

Theorem 3.7. *Every intuitionistic fuzzy contra pre-closed mapping is an intuitionistic fuzzy contra λ mapping but not conversely.*

Proof. Let $f : (X, \tau) \to (Y, \sigma)$ be an intuitionistic fuzzy contra pre-closed mapping. Let A be an IFOS in X. By hyothesis, $f(A)$ is an IFPCS in Y. Since every IFPCS is an IFλCS, (A) is an IFλCS in X [6]. Hence f is an an intuitionistic fuzzy contra λ-closed mappings. □

Remark 3.8. Converse of the above theorem is not true as seen from the following example.

Example 3.9. Let $X = \{a, b\}, Y = \{u, v\}$ and $U = \{\langle a, 0.5, 0.5\rangle, \langle b, 0.3, 0.6\rangle\}$, $V = \{\langle u, 0.5, 0.5\rangle, \langle v, 0.8, 0.2\rangle\}$. Then $\tau = \{\underset{\sim}{0}, \underset{\sim}{1}, U\}$ and $\sigma = \{\underset{\sim}{0}, \underset{\sim}{1}, V\}$ be intuitionistic fuzzy topologies of X and Y respectively. Consider a mapping $f : (X, \tau) \to (Y, \sigma)$ as $f(a) = u$ and $f(b) = v$. This f is an intuitionistic fuzzy contra λ closed mappings but not an intuitionistic fuzzy ccontra pre closed mappings. Since U is an IFOS in X. But $f(U) = \{\langle u, 0.5, 0.5\rangle, \langle v, 0.3, 0.6\rangle\}$ is not intuitionistic fuzzy preclosed set in Y. Hence, f is not intuitionistic fuzzy contra pre closed mapping.

Theorem 3.10. *Every intuitionistic fuzzy contra α-closed mapping is an intuitionistic fuzzy contra λ-mapppings but not conversly.*

Proof. Let $f : (X, \tau) \to (Y, \sigma)$ be an intuitionistic fuzzy contra α-closed mapping. Let A be an IFOS in X. By hypothesis, $f(A)$ is an IF α-CS in Y. Since every IF α-CS is an IF λ-CS, $f(A)$ is an IF λ-CS in X. Hence, f is an intuitionistic fuzzy contra λ-closed mapping. □

Example 3.11. Let $X = \{a, b\}, Y = \{u, v\}$ and $U = \{\langle a, 0.4, 0.6\rangle, \langle b, 0.2, 0.8\rangle\}$, $V = \{\langle u, 0.5, 0.5\rangle, \langle v, 0.3, 0.7\rangle\}$. Then $\tau = \{\underset{\sim}{0}, \underset{\sim}{1}, U\}$ and $\sigma = \{\underset{\sim}{0}, \underset{\sim}{1}, V\}$ be intuitionistic fuzzy topologies of X and Y, respectively. Consider a mapping $f : (X, \tau) \to (Y, \sigma)$ as $f(a) = u$ and $f(b) = v$. This f is an intuitionistic fuzzy contra λ-closed mappings but not an intuitionistic fuzzy contra α-closed mappings. Since U is an IFOS in Y. But $f(U) = \{\langle u, 0.4, 0.6\rangle, \langle v, 0.3, 0.7\rangle\}$ is not intuitionistic fuzzy α-closed set in X. Hence, f is not intuitionistic fuzzy contra α-closed mapping.

Remark 3.12. Intuitionistic fuzzy contra semi closed mappings and intuitionistic fuzzy contra λ-closed mappings are independent to each other for example.

Example 3.13. Let $X = \{a, b\}, Y = \{u, v\}$ and $U = \{\langle a, 0.5, 0.5\rangle, \langle b, 0.2, 0.5\rangle\}$, $V = \{\langle u, 0.5, 0.5\rangle, \langle v, 0.4, 0.5\rangle\}$. Then $\tau = \{\underset{\sim}{0}, \underset{\sim}{1}, U\}$ and $\sigma = \{\underset{\sim}{0}, \underset{\sim}{1}, V\}$ be the intuitionistic fuzzy topologies of X and Y respectively. Consider a mapping $f : (X, \tau) \to (Y, \sigma)$ as $f(a) = u$ and $f(b) = v$. This f is an intuitionistic fuzzy contra λ-closed mapping but not an intuitionistic fuzzy contra semi closed mapping. Since U is an IFOS in X. Since $f(U) = \{\langle u, 0.5, 0.5\rangle, \langle v, 0.2, 0.5\rangle\}$ is intuitionistic fuzzy λ-closed in Y, but not intuitionistic fuzzy semi closed set in Y. Hence, f is an intuitionistic fuzzy contra λ-closed mapping but not intuitionistic fuzzy contra semi closed mapping.

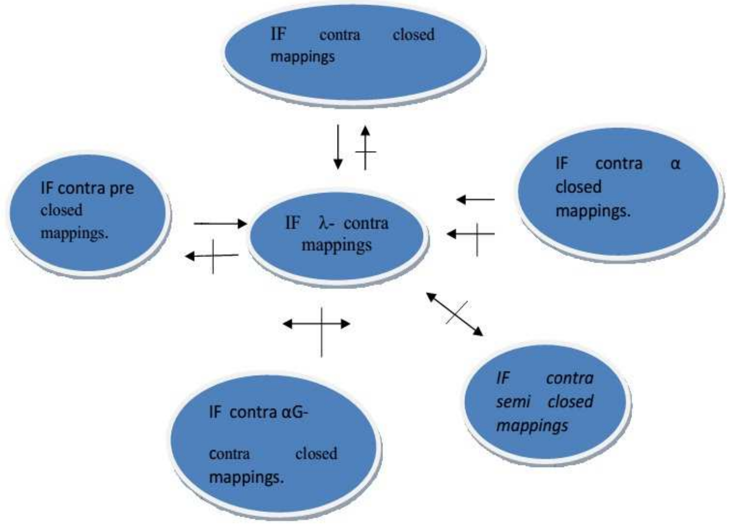
Example 3.14. Let $X = \{a, b\}, Y = \{u, v\}$ and $U = \{\langle a, 0.5, 0.6\rangle, \langle b, 0.4, 0.6\rangle\}$, $V = \{\langle u, 0.5, 0.5\rangle, \langle v, 0.1, 0.9\rangle\}$. Then $\tau = \{\underset{\sim}{0}, \underset{\sim}{1}, U\}$ and $\sigma = \{\underset{\sim}{0}, \underset{\sim}{1}, V\}$ be intuitionistic fuzzy topologies of X and Y, respectively. Consider a mapping $f : (X, \tau) \to (Y, \sigma)$ as $f(a) = u$ and $f(b) = v$. This f is an intuitionistic fuzzy contra λ-closed mapping but not an intuitionistic fuzzy contra semi closed mapping. Since U is an IFOS in X. Since $f(U) = \{\langle u, 0.3, 0.6\rangle, \langle v, 0.5, 0.5\rangle\}$ is intuitionistic fuzzy λ-closed in Y, but not intuitionistic fuzzy semi closed set in Y. Hence, f is intuitionistic fuzzy contra λ-closed mappings but not intuitionistic fuzzy contra semi closed mappings.

Remark 3.15. Intuitionistic fuzzy contra αG closed mappings and intuitionistic fuzzy contra λ-closed mappings are independent to each other for example.

Example 3.16. Let $X = \{a, b\}, Y = \{u, v\}$ and $U = \{\langle a, 0.2, 0.6\rangle, \langle b, 0.2, 0.7\rangle\}$, $V = \{\langle u, 0.2, 0.4\rangle, \langle v, 0.3, 0.5\rangle\}$. Then $\tau = \{\underset{\sim}{0}, \underset{\sim}{1}, U\}$ and $\sigma = \{\underset{\sim}{0}, \underset{\sim}{1}, V\}$ be intuitionistic fuzzy topologies of X and Y respectively. Consider a mapping $f : (X, \tau) \to (Y, \sigma)$ as $f(a) = u$ and $f(b) = v$. This f is an intuitionistic fuzzy contra λ-closed mapping but not an intuitionistic fuzzy contra αG-closed mapping. Since U is an IFOS in X. Since $f(U) = \{\langle u, 0.3, 0.6\rangle, \langle v, 0.5, 0.5\rangle\}$ is intuitionistic fuzzy λ-closed in Y, but not intuitionistic fuzzy αG closed set in Y. Hence, f is intuitionistic fuzzy contra λ-closed mappings but not intuitionistic fuzzy contra αG closed mappings.

Example 3.17. Let $X = \{a, b\}, Y = \{u, v\}$ and $U = \{\langle a, 0.4, 0.6\rangle, \langle b, 0.2, 0.7\rangle\}$, $V = \{\langle u, 0.2, 0.6\rangle, \langle v, 0.2, 0.7\rangle\}$. Then $\tau = \{\underset{\sim}{0}, \underset{\sim}{1}, U\}$ and $\sigma = \{\underset{\sim}{0}, \underset{\sim}{1}, V\}$ be intuitionistic fuzzy topologies of X and Y, respectively. Consider a mapping $f : (X, \tau) \to (Y, \sigma)$ as $f(a) = u$ and $f(b) = v$. This f is an intuitionistic fuzzy contra αG-closed mappings but not λ-intuitionistic fuzzy contra-closed mappings. Since U is an IFOS in X, $f(U) = \{\langle u, 0.4, 0.6\rangle, \langle v, 0.2, 0.7\rangle\}$ is intuitionistic fuzzy αG-closed set in Y, but not intuitionistic fuzzy λ-closed. Hence, f is intuitionistic fuzzy contra αG-closed mappings but not intuitionistic fuzzy contra λ-closed mappings.

Remark 3.18. From the above examples and remarks we get the following relations



In this diagram $A \leftarrow B$ means that A implies B.
$A \not\leftarrow B$ means that B does not imply A. $A \not\leftrightarrow B$ means that A and B are independent to each other.

Theorem 3.19. *Let $f : (X, \tau) \to (Y, \sigma)$ be a mapping from an IFTS X into an IFTS Y. Then the following statements are equivalent.*

(a) *f is an intuitionistic fuzzy contra λ-closed mapping,*
(b) *$f(B)$ is an IF λ-OS in Y for every IFCS B in X.*

Proof. $(a) \Rightarrow (b)$. Let A be an IFCS in X. Then A^C is an IFOS in X. By hypothesis, $f(A^C) = (f(A))^C$ is an IF λ-CS in Y. Hence $f(A)$ is an IF λ-OS in Y.
$(b) \Rightarrow (a)$. Let B be an IFOS in X. Then B^C is an IFCS in Y. By (b), $f(B^C) = (f(B))^C$ is an IF λ-OS in Y. Hence, $f(B)$ is an IF λ-CS in Y. Therefore f is an intuitionistic fuzzy contra λ-closed mapping. □

Theorem 3.20. *If $f : X \to Y$ is an IF contra closed map and $g : Y \to Z$ is an IF λ-closed map, then $g \circ f$ is an IF contra λ-closed map.*

Proof. Let A be an IFOS in X, then $f(A)$ is an IFCS in Y, since f is an IF contra closed map. Since g is an IF λ-closed map, $g(f(A))$ is an if λ-CS in Z. Therefore $g \circ f$ is an IF λ-closed map. □

Definition 3.21. A mapping $f : (X, \tau) \to (Y, \sigma)$ is said to be intuitionistic fuzzy contra λ-open mapping if $f(V)$ is λ-open set in (Y, σ) for every closed set V in (X, τ).

Definition 3.22. An IFTS (X, τ) is said to be an intuitionistic fuzzy $\lambda_a T_{1/2}$ (in short IF$\lambda_a T_{1/2}$) space if every IFλCS in X is an IFPCS in X.

Definition 3.23. An IFTS (X, τ) is said to be an intuitionistic fuzzy $\lambda_b T_{1/2}$ (in short IF$\lambda_b T_{1/2}$) space if every IFλCS in X is an IFGCS in X.

Definition 3.24. An IFTS (X, τ) is said to be an intuitionistic fuzzy $\lambda_c T_{1/2}$ (in short IF$\lambda_c T_{1/2}$) space if every IFλCS in X is an IFαCS in X.

4. Conclusion

In this paper we have introduced intuitionistic fuzzy contra λ-closed mappings and studied some of its basic properties. Also we have studied the relationship between fuzzy contra λ-closed mappings and some of the intuitionistic fuzzy contra mappings already exist.

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