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Intuitionistic Fuzzy G*P-Closed Sets

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Abstract

The concept of intuitionistic fuzzy sets was introduced by Atanassov as a generalization of fuzzy sets. In 1997 Coker introduced the concept of intuitionistic fuzzy topological spaces. In 2008, Thakur and Chaturvedi introduced the notion of intuitionistic fuzzy generalized closed set in intuitionistic fuzzy topological space. After that different mathematicians worked and studied in different forms of intuitionistic fuzzy g-closed set and related topological properties. The aim of this paper is to introduce the new class of intuitionistic fuzzy closed sets called intuitionistic fuzzy g*p- closed sets in intuitionistic fuzzy topological space. The class of all intuitionistic fuzzy g*p--closed sets lies between the class of all intuitionistic fuzzy pre-closed sets and class of all intuitionistic fuzzy gp-closed sets. We also introduce the concepts of intuitionistic fuzzy g*p-- open sets, intuitionistic fuzzy g*p-continuous mappings intuitionistic fuzzy T*p space, intuitionistic fuzzy T**p space and intuitionistic fuzzy *Tp space in intuitionistic fuzzy topological spaces.

Keywords: Intuitionistic fuzzy g*p-closed sets, Intuitionistic fuzzy g*p-open sets Intuitionistic fuzzy g*p continuous mappings, intuitionistic fuzzy T*p space, intuitionistic fuzzy T**p space .and intuitionistic fuzzy *Tp space

2000, Mathematics Subject Classification: 54A

INTRODUCTION

After the introduction of fuzzy sets by Zadeh [23] in 1965 and fuzzy topology by Chang [5] in 1967, several researches were conducted on the generalizations of the notions of fuzzy sets and fuzzy topology. The concept of intuitionistic fuzzy sets was introduced by Atanassov [1] as a generalization of fuzzy sets. In the last 25 years various concepts of fuzzy mathematics have been extended for intuitionistic fuzzy sets. In 1997 Coker [8] introduced the concept of intuitionistic fuzzy topological spaces. In 2008 Thakur and Chtuvedi introduced the concepts of intuitionistic fuzzy generalized closed sets [15] in intuitionistic fuzzy topology. After that many weak and strong forms of intuitionistic fuzzy g-closed sets such as intuitionistic fuzzy rg-closed sets[16], intuitionistic fuzzy sg-closed sets[17], intuitionistic fuzzy g*-closed sets[6], intuitionistic fuzzy gα-closed sets[11], intuitionistic fuzzy w-closed sets[18], intuitionistic fuzzy rw-closed sets[19], intuitionistic fuzzy gpr-closed sets[20], intuitionistic fuzzy rgα-closed sets[21], intuitionistic fuzzy gsp-[14]closed sets, intuitionistic fuzzy gp-closed set[12] and intuitionistic fuzzy strongly g*-closed sets [2], intuitionistic fuzzy sgp-closed sets[3],intuitionistic fuzzy rgw-closed sets[4] have been appeared in the literature.

In the present paper we introduce the concepts of g*p-closed sets in intuitionistic fuzzy topological spaces. The class of intuitionistic fuzzy g*p-closed sets is properly placed between the class of intuitionistic fuzzy pre closed sets and intuitionistic fuzzy gp-closed sets. We also introduced the concepts of intuitionistic fuzzy g*p-open sets, and obtain some of their characterization and properties. As an application of this set we introduce intuitionistic fuzzy $-T^*_p$-space, intuitionistic fuzzy $-T^{**}_p$-space. and intuitionistic fuzzy $-{}^*T_p$-space Further, we introduce intuitionistic fuzzy g*p - continuous mappings with some of its properties.

I. PRELIMINARIES

Let X be a nonempty fixed set. An intuitionistic fuzzy set[1] A in X is an object having the form $A = \{<x, \mu_A(x), \gamma_A(x)> : x \in X\}$, where the functions $\mu_A : X \to [0,1]$ and $\Upsilon_A : X \to [0,1]$ denotes the degree of membership $\mu_A(x)$ and the degree of non membership $\gamma_A(x)$ of each element $x \in X$ to the set A respectively and $0 \le \mu_A(x) + \gamma_A(x) \le 1$ for each $x \in X$. The intutionistic fuzzy sets $\mathbf{0} = \{< x, 0, 1 > : x \in X\}$ and $\mathbf{1} = \{<x, 1, 0> : x \in X\}$ are respectively called empty and whole intuitionistic fuzzy set on X. An intuitionistic fuzzy set $A = \{<x, \mu_A(x), \gamma_A(x)> : x \in X\}$ is called a subset of an intuitionistic fuzzy set $B = \{<x, \mu_B(x), \gamma_B(x)> : x \in X\}$ (for short $A \subseteq B$) if $\mu_A(x) \le \mu_B(x)$ and $\gamma_A(x) \ge \gamma_B(x)$ for each $x \in X$. The complement of an intuitionistic fuzzy set $A = \{<x, \mu_A(x), \gamma_A(x)> : x \in X\}$ is the intuitionistic fuzzy set $A^c = \{ <x, \gamma_A(x), \mu_A(x)>: x \in X\}$. The intersection (resp. union) of any arbitrary family of intuitionistic fuzzy sets $A_i = \{< x, \mu_{A_i}(x), \gamma_{A_i}(x)> : x \in X, (i \in \wedge)\}$ of X be the intuitionistic fuzzy set $\cap A_i = \{<x, \wedge \mu_{A_i}(x), \vee \gamma_{A_i}(x)> : x \in X\}$ (resp. $\cup A_i = \{<x, \vee \mu_{A_i}(x), \wedge \gamma_{A_i}(x)>: x \in X\}$). Two intuitionistic fuzzy sets $A = \{<x, \mu_A(x), \gamma_A(x)> : x \in X\}$ and $B = \{<x, \mu_B(x), \gamma_B(x)> : x \in X\}$ are said be q-coincident (A_qB for short) if and only if $\exists$ an element $x \in X$ such that $\mu_A(x) > \gamma_B(x)$ or $\gamma_A(x) < \mu_B(x)$. A family $\Im$ of intuitionistic fuzzy sets on a non empty set X is called an intuitionistic fuzzy topology [3] on X if the intuitionistic fuzzy sets $\mathbf{0}, \mathbf{1} \in \Im$, and $\Im$ is closed under arbitrary union and finite intersection. The ordered pair $(X,\Im)$ is called an intuitionistic fuzzy topological space and each intuitionistic fuzzy set in $\Im$ is called an intuitionistic fuzzy open set. The compliment of an intuitionistic fuzzy open set in X is known as intuitionistic fuzzy closed set .The intersection of all intuitionistic fuzzy closed sets which contains A is called the closure of A. It denoted cl(A). The union of all intuitionistic fuzzy open subsets of A is called the interior of A. It is denoted int(A) [8].

Lemma 2.1 [8]**:** Let A and B be any two intuitionistic fuzzy sets of an intuitionistic fuzzy topological space (X, $\Im$). Then:

(a) $(A_qB) \Leftrightarrow A \subseteq B^c$.

(b) A is an intuitionistic fuzzy closed set in X $\Leftrightarrow$ cl (A) = A

(c) A is an intuitionistic fuzzy open set in X $\Leftrightarrow$ int (A) = A.

(d) cl (A^c) = $(\text{int}(A))^c$.

(e) int $(A^c) = (\text{cl}(A))^c$.

Definition 2.1 [9]: Let X is a nonempty set and $c\in X$ a fixed element in X. If $\alpha\in(0, 1]$ and $\beta\in[0, 1)$ are two real numbers such that $\alpha+\beta\leq 1$ then:

(a) $c(\alpha,\beta) = < x, c_\alpha, c_{1-\beta} >$ is called an intuitionistic fuzzy point in X, where α denotes the degree of membership of $c(\alpha,\beta)$, and β denotes the degree of non membership of $c(\alpha,\beta)$.

(b) $c(\beta) = < x, 0, 1-c_{1-\beta} >$ is called a vanishing intuitionistic fuzzy point in X, where β denotes the degree of non membership of $c(\beta)$.

Definition 2.2[10]: An intuitionistic fuzzy set A of an intuitionistic fuzzy topological space (X,$\Im$) is called:

(a) An intuitionistic fuzzy semi open of X if there is an intuitionistic fuzzy set O such that $O\subseteq A\subseteq cl(O)$.

(b) An intuitionistic fuzzy semi closed if the compliment of A is an intuitionistic fuzzy semi open set.

(c) An intuitionistic fuzzy regular open of X if int(cl(A)) = A .

(d) An intuitionistic fuzzy regular closed of X if cl(int(A))= A.

(e) An intuitionistic fuzzy pre open if $A \subseteq$ int (cl(A)) .

(f) An intuitionistic fuzzy pre closed if cl(int(A)) $\subseteq$ A

(g) An intuittionistic fuzzy α-open $A \subseteq$ int (cl(intA)))

(h) intuitionistic fuzzy α- closed if cl(int(cl(A))) $\subseteq$ A

Definition 2.3[10] If A is an intuitionistic fuzzy set in intuitionistic fuzzy topological space(X,$\Im$) then

(a) scl (A) = $\cap$ { F: A $\subseteq$ F, F is intuitionistic fuzzy semi closed}

(b) pcl (A) = $\cap$ { F: A $\subseteq$ F, F is intuitionistic fuzzy pre closed}

(c) αcl (A) = $\cap$ { F: A $\subseteq$ F, F is intuitionistic fuzzy α closed}

(d) spcl(A) = $\cap$ { F: A $\subseteq$ F, F is intuitionistic fuzzy semi pre-closed}

Definition 2.4: An intuitionistic fuzzy set A of an intuitionistic fuzzy topological space (X,$\Im$) is called:

(a) Intuitionistic fuzzy g-closed if cl (A) $\subseteq$ O whenever A $\subseteq$ O and O is intuitionistic fuzzy open.[15]

(b) Intuitionistic fuzzy rg-closed if cl (A) $\subseteq$ O whenever A $\subseteq$ O and O is intuitionistic fuzzy regular open.[16]

(c) Intuitionistic fuzzy sg-closed if scl (A) $\subseteq$ O whenever A $\subseteq$ O and O is intuitionistic fuzzy semi open.[17]

(d) Intuitionistic fuzzy g*-closed if cl (A) $\subseteq$ O whenever A $\subseteq$ O and O is intuitionistic fuzzy g-open.[6]

(e) Intuitionistic fuzzy gα-closed if αcl (A) $\subseteq$ O whenever A $\subseteq$ O and O is intuitionistic fuzzy α- open.[11]

(f) Intuitionistic fuzzy w-closed if cl (A) $\subseteq$ O whenever A $\subseteq$ O and O is intuitionistic fuzzy semi open.[18]

(g) Intuitionistic fuzzy rw-closed if cl (A) $\subseteq$ O whenever A $\subseteq$ O and O is intuitionistic fuzzy regular semi open.[19]

(h) Intuitionistic fuzzy gpr-closed if pcl (A) $\subseteq$ O whenever A $\subseteq$ O and O is intuitionistic fuzzy regular open.[20]

(i) Intuitionistic fuzzy rgα-closed if αcl (A) $\subseteq$ O whenever A $\subseteq$ O and O is intuitionistic fuzzy regular α-open.[21]

(j) Intuitionistic fuzzy gsp-closed if spcl (A) $\subseteq$ O whenever A $\subseteq$ O and O is intuitionistic fuzzy - open.[14]

(k) Intuitionistic fuzzy gp-closed if pcl (A) $\subseteq$ O whenever A $\subseteq$ O and O is intuitionistic fuzzy open.[12]

(l) Intuitionistic fuzzy strongly g*-closed set if cl (int(A))$\subseteq$ O whenever A $\subseteq$ O and O is intuitionistic fuzzy g-open in X.[2].

(m) Intuitionistic fuzzy gspr-closed set if spcl (A) $\subseteq$ O whenever A $\subseteq$ O and O is intuitionistic fuzzy – regular open.[13]

(n) Intuitionistic fuzzy sgp-closed set if pcl (A) $\subseteq$ O whenever A $\subseteq$ O and O is intuitionistic fuzzy – semi open.[3]

(o) Intuitionistic fuzzy rgw-closed set if cl (intA)) $\subseteq$ O whenever A $\subseteq$ O and O is intuitionistic fuzzy – regular semi open.[4]

The complements of the above mentioned closed set are their respective open sets.

Remark 2.1:

(a) Every intuitionistic fuzzy gp-closed set is intuitionistic fuzzy gsp-closed but its converse may not be true.[12]

(b) Every intuitionistic fuzzy gpr- closed set is intuitionistic fuzzy gspr-closed but its converse may not be true.[13]

(c) Every intuitionistic fuzzy gsp- closed set is intuitionistic fuzzy gspr-closed but its converse may not be true.[13]

(d) Every intuitionistic fuzzy sgp- closed set is intuitionistic fuzzy gpr-closed but its converse may not be true.[3]

(e) Every intuitionistic fuzzy α- closed set is intuitionistic fuzzy sgp-closed but its converse may not be true.[3]

Definition 2.5 [**10**]: Let X and Y are two nonempty sets and f: X $\rightarrow$ Y is a function. :

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

$$f^{-1}(B) = \langle x, f^{-1}(\mu_B)(x), f^{-1}(\gamma_B)(x)\rangle : x \in X\}.$$

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

Definition 2.6[10]: Let (X,$\Im$) and (Y, σ) be two intuitionistic fuzzy topological spaces and let *f*: X$\rightarrow$Y be a function. Then *f* is said to be, Intuitionistic fuzzy continuous if the pre image of each intuitionistic fuzzy open set of Y is an intuitionistic fuzzy open set in X.

Definition 2.7*:* Let (X,$\Im$) and (Y, σ) be two intuitionistic fuzzy topological spaces and let f: X$\rightarrow$Y be a function. Then *f* is said to be

(a) Intutionistic fuzzy gp-continuous if the pre image of every intuitionistic fuzzy closed set in Y is intuitionistic fuzzy gp –closed in X.[12]

(b) Intutionistic fuzzy gpr-continuous if the pre image of every intuitionistic fuzzy closed set in Y is intuitionistic fuzzy gpr –closed in X. [20]

(c) Intutionistic fuzzy g*-continuous if the pre image of every intuitionistic fuzzy closed set in Y is intuitionistic fuzzy g* –closed in X.[7]

Remark 2.2

(a) Every intuitionistic fuzzy continuous mapping is intuitionistic fuzzy g*-continuous, but the converse may not be true [7].

(b) Every intuitionistic fuzzy continuous mapping is intuitionistic fuzzy gp-continuous, but the converse may not be true [12].

(c) Every intuitionistic fuzzy gp- continuous mapping is intuitionistic fuzzy gpr-continuous, but the converse may not be true [20].

Definition 2.8: An intuitionistic fuzzy topological space $(X,\Im)$ is said to be :

(a) Intuitionistic fuzzy $T_{1/2}$ space if every intuitionistic fuzzy g-closed set is closed in $(X,\Im)$.[15]

(b) Intuitionistic fuzzy $pT_{1/2}$ space if every intuitionistic fuzzy gp-closed set is closed in $(X,\Im)$.[12]

(c) Intuitionistic fuzzy pre regular$T_{1/2}$ space if every intuitionistic fuzzy gpr-closed set is closed in $(X,\Im)$.[20]

(d) Intuitionistic fuzzy semi pre regular -$T_{1/2}$ space if every intuitionistic fuzzy gspr-closed set is closed in $(X,\Im)$.[13]

II. INTUITIONISTIC FUZZY G*P -CLOSED SET

Definition 3.1: An intuitionistic fuzzy set A of an intuitionistic fuzzy topological space $(X,\Im)$ is called an intuitionistic fuzzy g*p -closed if pcl (A) $\subseteq$ O whenever A $\subseteq$ O and O is intuitionistic fuzzy g-open in X.

First we prove that the class of intuitionistic fuzzy g*p- closed sets properly lies between the class of intuitionistic fuzzy pre closed sets and the class of intuitionistic fuzzy gp-closed sets.

Theorem 3.1: Every intuitionistic fuzzy pre closed set is intuitionistic fuzzy g*p-closed.

Proof: Let A is intuitionistic fuzzy pre closed set. Let A $\subseteq$ U and U is intuitionistic fuzzy g-open sets in X. Since A is intuitionistic fuzzy pre closed set we have A= pcl(A). Hence pcl(A) $\subseteq$ U , whenever A $\subseteq$ U and U is intuitionistic fuzzy g open in

X. Therefore A is intuitionistic fuzzy g*p-closed set.

Remark 3.1: The converse of above theorem need not be true as from the following example.

Example 3.1: Let X = {a, b, c} and intuitionistic fuzzy sets O and U are defined as follows

O = { < a,0.9,0.1.> ,<b,0,1>,<c,0,1>}

U = { < a,0,1,> ,<b,0.8,0.1>,<c,0.6,0.3>}

Let $\Im = \{\mathbf{0}, O, U, \mathbf{1}\}$ be an intuitionistic fuzzy topology on X. Then the intuitionistic fuzzy set A = {<a, 0.7, 0.2>,<b ,0.6, 0.3> <c, 0, 1>} is intuitionistic fuzzy g*p -closed but it is not intuitionistic fuzzy preclosed .

Theorem 3.2: Every intuitionistic fuzzy α-closed set is intuitionistic fuzzy g*p-closed.

Proof: Let A is intuitionistic fuzzy α-closed set. Let A ⊆ U and U is intuitionistic fuzzy g-open sets in X. Since A is intuitionistic fuzzy α-closed set we have A= αcl(A). Hence αcl(A) ⊆ U . But pcl(A) ⊆ αcl(A) , therefore pcl(A) ⊆ U , whenever A ⊆ U and U is intuitionistic fuzzy g- open in X. Therefore A is intuitionistic fuzzy g*p-closed set.

Remark 3.2: The converse of above theorem need not be true as from the following example.

Example 3.2: Let X = {a, b, c} and intuitionistic fuzzy sets O and U are defined as follows

O = { < a,0.6,0.2.> ,<b,0,1>,<c,0,1>}

U = { < a,0.5,0.4,> ,<b,0.8,0.1>,<c,0,1>}

Let $\Im = \{\mathbf{0}, O, U, \mathbf{1}\}$ be an intuitionistic fuzzy topology on X. Then the intuitionistic fuzzy set A = {<a, 0.7, 0.2>,<b ,0, 1> <c, 0.7, 0.2>} is intuitionistic fuzzy g*p -closed but it is not intuitionistic fuzzy α-closed .

Theorem 3.3: Every intuitionistic fuzzy closed set is intuitionistic fuzzy g*p-closed.

Proof: Let A is intuitionistic fuzzy closed set. Let A ⊆ U and U is intuitionistic fuzzy g-open sets in X. Since A is intuitionistic fuzzy -closed set we have A= cl(A). But pcl(A) ⊆ cl(A) ,therefore pcl(A) ⊆ U. whenever A ⊆ U and U is intuitionistic fuzzy g-open in X. Hence A is intuitionistic fuzzy g*p-closed set.

Remark 3.3: The converse of above theorem need not be true as from the following example.

Example 3.3: Let X = {a, b} and intuitionistic fuzzy sets O and U are defined as follows

O = { < a,0..2,0.8.> ,<b,0.1,0.9>}

U = { < a,0.5,0.4,> ,<b,0.6,0.4>}

Let $\Im$ = {***0***, O, U***, 1***}be an intuitionistic fuzzy topology on X. Then the intuitionistic fuzzy set A = {<a, 0.9, 0.1>,<b ,0.6, 0.3> } is intuitionistic fuzzy g*p -closed but it is not intuitionistic fuzzy closed .

Theorem 3.4: Every intuitionistic fuzzy regular -closed set is intuitionistic fuzzy g*p-closed.

Proof: It follows from the fact that every intuitionistic fuzzy regular closed set is intuitionistic fuzzy closed set and Theorem 3.3.

Remark 3.4: The converse of above theorem need not be true as from the following example.

Example 3.4: Let X = {a, b, c} and intuitionistic fuzzy sets O and U are defined as follows

O = { < a,0..2,0.8.> ,<b,0.1,0.9>, ,<c,0.,1>, }

U = { < a,0.5,0.4,> ,<b,0, 1>,<c,0.4.,0.3>, }

Let $\Im$ = {***0***, O, U***, 1***}be an intuitionistic fuzzy topology on X. Then the intuitionistic fuzzy set A = {<a, 0.9, 0.1>,<b ,0.6, 0.3> ,<c,0.,1>, } is intuitionistic fuzzy g*p -closed but it is not intuitionistic fuzzy regular-closed .

Theorem 3.5: Every intuitionistic fuzzy g*-closed set is intuitionistic fuzzy g*p-closed.

Proof: Let A is intuitionistic fuzzy g*-closed set. Let A $\subseteq$ U and U is intuitionistic fuzzy g-open sets in X. By definition of intuitionistic fuzzy g*-closed set, cl(A) $\subseteq$ U. Note that pcl(A) $\subseteq$ cl(A) is always true. Therefore pcl(A) $\subseteq$ U. Hence A is intuitionistic fuzzy g*p-closed set.

Remark 3.5: The converse of above theorem need not be true as from the following example.

Example 3.5: Let X = {a, b, c} and intuitionistic fuzzy sets O and U defined as follows

O = {< a , 0.9, 0.1.> ,< b, 0,1>,< c, 0, 1>}

U = {< a, 0.8, 0.1,> ,<b, 0.7, 0,2>,<c, 0, 1>}

Let ℑ = {***0***, O, U**,** ***1***}be an intuitionistic fuzzy topology on X. Then the intuitionistic fuzzy set A = {<a ,0, 1>,<b, 0.8, 0.1> <c, 0, 1>} is intuitionistic fuzzy g*p -closed but it is not intuitionistic fuzzy g*-closed .

Theorem 3.6: Every intuitionistic fuzzy g*p-closed set is intuitionistic fuzzy gpr-closed.

Proof: Let A is intuitionistic fuzzy g*p-closed set. Let A $\subseteq$ U and U is intuitionistic fuzzy regular open sets in X. Since every intuitionistic fuzzy regular open set is g-open, U is intuitionistic fuzzy g-open By definition of intuitionistic fuzzy g*p-closed set, pcl(A) $\subseteq$ U. Hence A is intuitionistic fuzzy gpr-closed set.

Remark 3.6: The converse of above theorem need not be true as from the following example.

Example 3.6: Let X = {a, b, c, d } and intuitionistic fuzzy sets O,U, V,W defined as follows

O = { < a,0.9 ,0.i> ,<b,0, 1>,<c,0, 1>,<d, 0, 1>}

U = { < a ,0, 1,> ,<b, 0.8, 0.1>,<c, 0, 1>,<d ,0, 1>}

V = { < a, 0.9, 0.1> ,<b, 0.8 ,0.1,>,<c, 0, 1>,<d, 0, 1>}

W = { < a, 0.9, 0.1,> ,<b, 0.8 ,0.1>,<c ,0.7, 0.2>,<d, 0, 1>}

Let ℑ = {***0***, O, U**,** V, W, ***1***}be an intuitionistic fuzzy topology on X. Then the intuitionistic fuzzy set A = {<a ,0, 1>,<b, 0, 1> <c, 0.7, 0.2>,<d ,0, 1>} is intuitionistic fuzzy gpr-closed set but it is not intuitionistic fuzzy g*p-closed.

Theorem 3.7: Every intuitionistic fuzzy g*p-closed set is intuitionistic fuzzy gp-closed.

Proof: Let A is intuitionistic fuzzy g*p-closed set. Let A $\subseteq$ U and U is intuitionistic fuzzy open sets in X. Since every intuitionistic fuzzy open set is intuitionistic fuzzy g- open sets, U is intuitionistic fuzzy g- open sets such that A $\subseteq$ U. Now by definition of intuitionistic fuzzy g*p-closed sets pcl(A) $\subseteq$ U. We have pcl(A) $\subseteq$ U whenever A $\subseteq$ U and U is intuitionistic fuzzy open in X. Therefore A is intuitionistic fuzzy gp-closed set.

Remark 3.7: The converse of above theorem need not be true as from the following example.

Example 3.7: Let X = {a, b, c} and intuitionistic fuzzy sets O is defined as follows

O = { < a,0.6,0.2.> ,<b,0,1>,<c,0,1>}

Let $\Im$ = {***0***, O, ***1***}be an intuitionistic fuzzy topology on X. Then the intuitionistic fuzzy set A = {<a, 0.7, 0.2>, <b ,0.7, 0.3> <c, 0, 1>} is intuitionistic fuzzy gp - closed but it is not intuitionistic fuzzy g*p-closed .

Theorem 3.8: Every intuitionistic fuzzy g*p-closed set is intuitionistic fuzzy gspr-closed.

Proof: Let A is intuitionistic fuzzy g*p-closed set. Let A $\subseteq$ U and U is intuitionistic fuzzy regular open sets in X. Since every intuitionistic fuzzy regular open set is intuitionistic fuzzy g- open sets, U is intuitionistic fuzzy g- open sets such that A $\subseteq$ U. Now by definition of intuitionistic fuzzy g*p-closed sets pcl(A) $\subseteq$ U. Note that spcl(A) $\subseteq$ pcl(A) is always true. We have spcl(A) $\subseteq$ U whenever A $\subseteq$ U and U is intuitionistic fuzzy regular open in X. Therefore A is intuitionistic fuzzy gspr-closed set.

Remark 3.8: The converse of above theorem need not be true as from the following example

Example 3.8: Let X = {a, b, c, d} and intuitionistic fuzzy sets O,U defined as follows

O = { < a, 0.7, 0.1> ,<b, 0.6, 0.2 >,<c ,0, 1>,<d, 0, 1> }

U = { < a, 0, 1,> ,<b, 0, 1>,<c, 0.7, 0.2>,<d, 0.6, 0.1> }

Let $\Im$ = {***0***, O, U***,*** ***1***}be an intuitionistic fuzzy topology on X. Then the intuitionistic fuzzy set A ={<a, 0.7, 0.1 >,<b, 0, 1 >,<c, 0, 1>,< d, 0, 1>} is intuitionistic fuzzy gspr -closed but it is not intuitionistic fuzzy g*p-closed.

Theorem 3.9: Every intuitionistic fuzzy g*p-closed set is intuitionistic fuzzy gsp-closed.

Proof: Let A is intuitionistic fuzzy g*p-closed set. Let A $\subseteq$ U and U is intuitionistic fuzzy open sets in X. Since every intuitionistic fuzzy open set is intuitionistic fuzzy g-open, U is intuitionistic fuzzy g-open set Now by definition of intuitionistic fuzzy g*p-closed sets pcl(A) $\subseteq$ U. Note that spcl(A) $\subseteq$ pcl(A) is always true. We have spcl(A) $\subseteq$ U whenever A $\subseteq$ U and U is intuitionistic fuzzy open in X. Therefore A is intuitionistic fuzzy gsp-closed set.

Remark 3.9: The converse of above theorem need not be true as from the following example.

Example 3.9: Let X = {a, b} and $\Im$ = $\Im$ = {***0***, U***,*** ***1***}be an intuitionistic fuzzy topology on X, where U={<a, 0.5, 0.3>,<b, 0.2, 0.3>}.Then the intuitionistic fuzzy set A = {<a, 0.2 ,0.4>,<b, 0.6, 0.1>} is intuitionistic fuzzy gsp -closed but it is not intuitionistic fuzzy g*p- closed.

Theorem 3.10: Every intuitionistic fuzzy g*p-closed set is intuitionistic fuzzy sgp-closed.

Proof: Let A is intuitionistic fuzzy g*p-closed set. Let A $\subseteq$ U and U is intuitionistic fuzzy semi open sets in X. Since every intuitionistic fuzzy semi open set is intuitionistic fuzzy g-open, U is intuitionistic fuzzy g-open set Now by definition of intuitionistic fuzzy g*p-closed sets pcl(A) $\subseteq$ U. Therefore A is intuitionistic fuzzy spg-closed set.

Remark 3.10: The converse of the above theorem need not be true as from the following example.

Example 3.10: Let X = {a, b, c, d } and intuitionistic fuzzy sets O,U, V,W defined as follows

O = { < a,0.9,0.i> ,<b,0,1>,<c,0,1>,<d,0,1>}

U = { < a,0,1,> ,<b,0.8,0.1>,<c,0,1>,<d,0,1>}

V = { < a,0.9,0.1> ,<b,0.8,0.1,>,<c,0,1>,<d,0,1>}

W = { < a,0.9,0.1,> ,<b,0.8,0.1>,<c,0.7,0.2>,<d,0,1>}

Let $\Im$ = {***0***, O, U, V, W, ***1***} be an intuitionistic fuzzy topology on X. Then the intuitionistic fuzzy set A = {< a,0, 1>,< b, 0, 1> <c, 0.7, 0.2>,< d, 0, 1 >} is intuitionistic fuzzy sgp -closed but it is not intuitionistic fuzzy g*p-closed.

Remark 3.11: From the above discussion and known results we have the following diagram of implications:

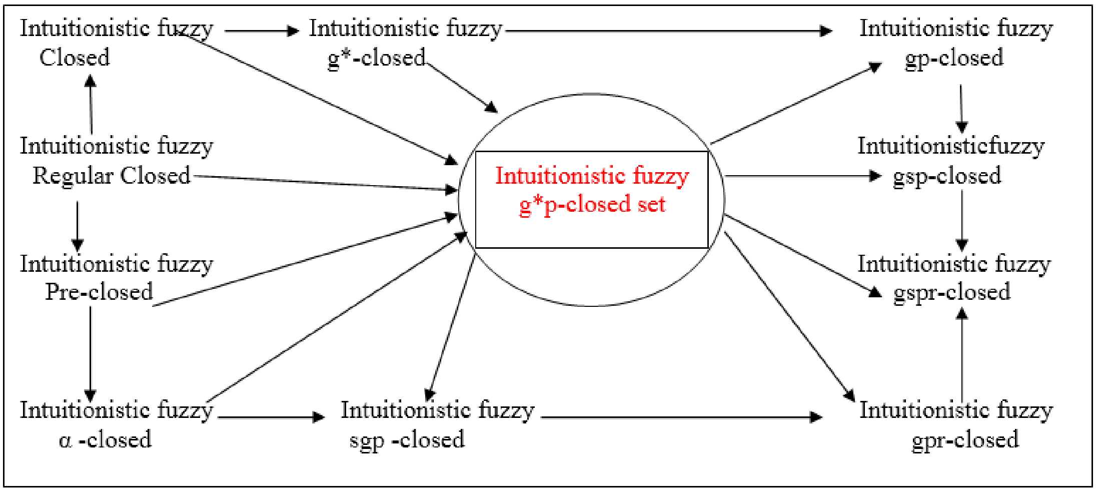

Figure 1. Relations between intuitionistic fuzzy g*p-closed set and other existing intuitionistic fuzzy closed sets

Theorem 3.11: Let $(X,\Im)$ be an intuitionistic fuzzy topological space and A is an intuitionistic fuzzy set of X. Then A is intuitionistic fuzzy g*p-closed if and only if $\rceil(AqF) \Rightarrow \rceil(pcl(A)qF)$ for every intuitionistic fuzzy g- closed set F of X.

Proof: **Necessity**: Let F be an intuitionistic fuzzy g-closed set of X and $\rceil(AqF)$. Then by Lemma 2.1(a), $A \subseteq F^c$ and F^c is intuitionistic fuzzy g-open in X. Therefore $pcl(A) \subseteq F^c$ by Def 3.1 because A is intuitionistic fuzzy g*p-closed. Hence by lemma 2.1(a), $\rceil(pcl(A)qF)$

Sufficiency: Let O be an intuitionistic fuzzy g-open set of X such that $A \subseteq O$ i.e. $A \subseteq ((O)^c)^c$ Then by Lemma 2.1(a), $\rceil(A_q O^c)$ and O^c is an intuitionistic fuzzy g- closed set in X. Hence by hypothesis $\rceil(pcl\ (A)\ _q\ O^c)$. Therefore by Lemma 2.1(a), $pcl\ (A) \subseteq ((O)^c)^c$ i .e. $pcl\ (A) \subseteq O$ Hence A is intuitionistic fuzzy g*p-closed in X.

Remark 3.12: The intersection of two intuitionistic fuzzy g*p-closed sets in an intuitionistic fuzzy topological space $(X,\Im)$ may not be intuitionistic fuzzy g*p-closed. For,

Example 3.11: Let X = {a, b, c, d } and intuitionistic fuzzy sets O,U, V,W defined as follows

O = { < a ,0.9, 0.1 > ,<b, 0 ,1>,<c, 0, 1>,<d, 0 ,1>}

U = { < a, 0, 1,> ,<b ,0.8 ,0.1>,<c ,0, 1> ,<d ,0, 1>}

V = { < a ,0.9, 0.1> ,<b, 0.8, 0.1,>,<c, 0, 1>,<d, 0, 1>}

W = { < a, 0.9, 0.1,> ,<b,0.8, 0.1 >,<c, 0.7, 0.2>,< d, 0, 1>}

Let $\Im$ = {***0***, O, U, V, W, ***1***}be an intuitionistic fuzzy topology on X. Then the intuitionistic fuzzy set A = {<a, 0.9, 0.1 >,<b, 0.8, 0.1 > < c, 0 ,1>,< d, 0, 1>} and

$B = \{<a, 0.9, 0.1 >, < b, 0, 1>, < c, 0.7, 0.2 > ,< d, 0.9 ,0.1>\}$

are intuitionistic fuzzy g*p-closed in $(X, \Im)$ but $A \cap B$ is not intuitionistic fuzzy g*p-closed.

Theorem 3.12: Let A be an intuitionistic fuzzy g*p-closed set in an intuitionistic fuzzy topological space $(X, \Im)$ and $A \subseteq B \subseteq pcl(A)$ .Then B is intuitionistic fuzzy g*p-closed in X.

Proof: Let O be an intuitionistic fuzzy g-open set in X such that $B \subseteq O$. Then $A \subseteq O$ and since A is intuitionistic fuzzy g*p-closed, $pcl(A) \subseteq O$. Now $B \subseteq pcl(A) \Rightarrow pcl(B) \subseteq pcl(A) \subseteq O$.. Consequently B is intuitionistic fuzzy g*p-closed**.**

Definition 3.2: An intuitionistic fuzzy set A of an intuitionistic fuzzy topological space $(X, \Im)$ is called intuitionistic fuzzy g*p--open if and only if its complement A^c is intuitionistic fuzzy g*p-closed.

Remark 3.13: Every intuitionistic fuzzy -open set is intuitionistic fuzzy g*p-open but its converse may not be true.

Example 3.12: Let X = {a, b} and $\Im = \{\mathbf{0}, U, \mathbf{1}\}$be an intuitionistic fuzzy topology on X, where $U=\{<a ,0.7, 0.2 >,<b ,0.6 ,0.3>\}$.Then the intuitionistic fuzzy set $A=\{<a, 0.2, 0.7 >,< b, 0.1, 0.8 >\}$ is intuitionistic fuzzy g*p-open in $(X, \Im)$ but it is not intuitionistic fuzzy open in $(X, \Im)$.

Theorem 3.13: An intuitionistic fuzzy set A of an intuitionistic fuzzy topological space $(X, \Im)$ is intuitionistic fuzzy g*p-open if $F \subseteq pcl(A)$ whenever F is intuitionistic fuzzy g-closed and $F \subseteq A$.

Proof: Follows from definition 3.1 and Lemma 2.1

Theorem 3.14: Let A be an intuitionistic fuzzy g*p-open set of an intuitionistic fuzzy topological space $(X ,\Im)$ and $pint(A) \subseteq B \subseteq A$. Then B is intuitionistic fuzzy g*p-open.

Proof: Suppose A is an intuitionistic fuzzy g*p-open in X and $pint(A) \subseteq B \subseteq A$. $\Rightarrow A^c \subseteq B^c \subseteq (pint(A))^c \Rightarrow A^c \subseteq B^c \subseteq pcl(A^c)$ by Lemma 2.1(d) and A^c is intuitionistic fuzzy g*p-closed it follows from theorem 3.12 that B^c is intuitionistic fuzzy g*p-closed .Hence B is intuitionistic fuzzy g*p-open.

4: INTUITIONISTIC FUZZY G*P- CONTINUOUS MAPPINGS

Definition 4.1*:* A mapping $f : (X, \Im) \to (Y, \sigma)$ is intuitionistic fuzzy g*p- continuous if inverse image of every intuitionistic fuzzy closed set of Y is intuitionistic fuzzy g*p-closed set in X.

Theorem 4.1*:* A mapping *f* : (X, ℑ)→(Y, σ) is intuitionistic fuzzy g*p- continuous if and only if the inverse image of every intuitionistic fuzzy open set of Y is intuitionistic fuzzy g*p-open in X.

Proof*:* It is obvious because $f^{-1}(U^c) = (f^{-1}(U))^c$ for every intuitionistic fuzzy set U of Y.

Remark4.1*:* Every intuitionistic fuzzy continuous mapping is intuitionistic fuzzy g*p-continuous, but converse may not be true. For,

Example 4.1: Let X = {a, b}, Y ={x, y} and intuitionistic fuzzy sets U and V are defined as follows :

U= {< a, 0.7, 0.2>, < b, 0.6, 0.3>}

V= {<x, 0.7, 0.2>, <y, 0.8, 0.1>}

Let **ℑ** = {***0*, **U**, 1}** and σ = {**0,** V**, 1}** be intuitionistic fuzzy topologies on X and Y respectively. Then the mapping *f*: (X,ℑ) →(Y, σ) defined by *f* (a) = x and *f* (b) = y is intuitionistic fuzzy g*p- continuous but not intuitionistic fuzzy continuous.

Remark4.2*:* Every intuitionistic fuzzy g*-continuous mapping is intuitionistic fuzzy g*p-continuous, but converse may not be true. For,

Example 4.2*:* Let X = {a, b}, Y ={x ,y} and intuitionistic fuzzy sets U and V are defined as follows :

U= {< a, 0.5, 0.5>, < b, 0.4, 0.6>} , V= {<a, 0.5, 0.5>, <b, 0.3, 0.7>}

Let **ℑ** = { ***0*,** U**, *1*}** and σ ={ **0,** V**, 1}** be intuitionistic fuzzy topologies on X and Y respectively. Then the mapping *f*: (X,ℑ) →(Y, σ) defined by *f* (a) = x and *f* (b) = y is intuitionistic fuzzy g*p- continuous but not intuitionistic fuzzy g*-continuous.

Remark 4.3: Every intuitionistic fuzzy g*p-continuous mapping is intuitionistic fuzzy gpr-continuous, but converse may not be true. For,

Example 4.3: Let X = {a, b, c, d, e} and Y= {p, q, r, s, t} and intuitionistic fuzzy sets O, U, V and W defined as follows

O = { < a,0.9,0.1> ,<b,0.8,0.1>,<c,0,1>,<d,0,1> <e,0,1>}

U = { < a,0,1,> ,<b,0,1>,<c,0.8,0.1>,<d,0.7,0.2> <e,0,1>}

V = { < a,0.9,0.1> ,<b,0.8,0.1>,<c,0.8,0.1>, <d,0.7,0.2>,<e,0,1>}

W= {<a,0.9,0.1 >,<b,0,1 >,<c,0,1>,<d,0,1>,<e,0,1>}

Let ℑ = {***0***, O, U, V ***,1***}and σ ={***0***, W, ***1***}be intuitionistic fuzzy topologies on X and Y respectively. Then the mapping f: $(X,\Im) \to (Y, \sigma)$ defined by $f(a) = p$, $f(b) = q$, $f(c) = r$, $f(d) = s$ and $f(e) = t$ is intuitionistic fuzzy gpr continuous but not intuitionistic fuzzy g*p-continuous.

Remark 4.4: Every intuitionistic fuzzy g*p-continuous mapping is intuitionistic fuzzy gp-continuous, but converse may not be true. For,

Example 4.4: Let X = {a, b, c}, Y ={x, y, z } and intuitionistic fuzzy sets O, U and V are defined as follows

O = {< a, 0.9, 0.1 > ,<b, 0,1 > <c,0,1>}

U= {< a, 0, 1 > ,<b, 0.8,0.1 > ,<c,0,1> , V = {<a, 0.9, 0.1>, <b,0.8,0.1> ,<c,0,1>}

Let $\Im$ = {***0***, O, U, ***1***}and intuitionistic fuzzy sets U and V are defined as follows σ ={{***0***, V ,***1***}be intuitionistic fuzzy topologies on X and Y respectively. Then the mapping f: $(X,\Im)$. $\to(Y, \sigma)$ defined by $f(a) = x$ $f(b) = y$ and $f(c) = z$ is intuitionistic fuzzy gp-continuous but it is not intuitionistic fuzzy g*p- continuous.

Remark 4.5: From the above discussion and known results we have the following diagram of implication

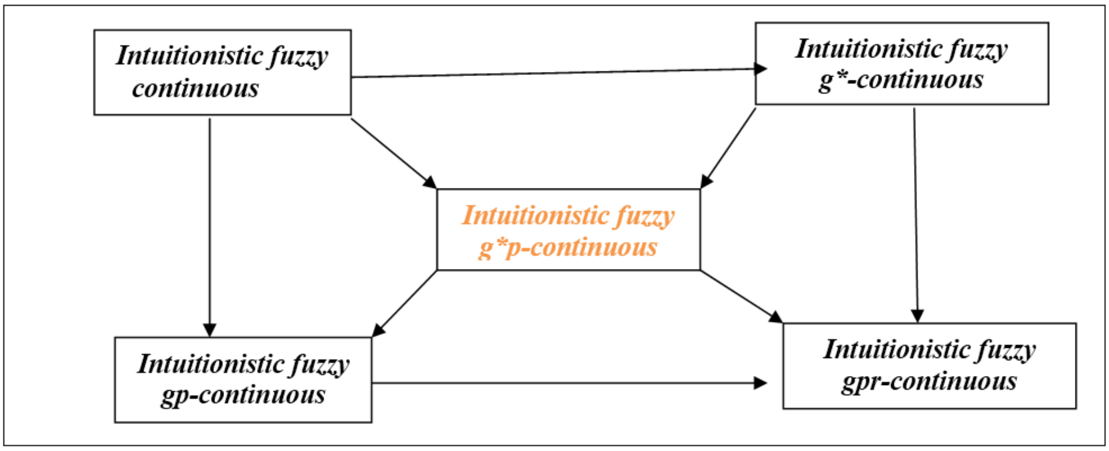

Fig.2 Relations between intuitionistic fuzzy g*p-continuous mappings and other existing intuitionistic fuzzy continuous mappings.

Theorem 4.2: If f: $(X,\Im) \to (Y, \sigma)$ is intuitionistic fuzzy g*p- continuous then for each intuitionistic fuzzy point $c(\alpha,\beta)$ of X and each intuitionistic fuzzy g*open set V of Y such that $f(c(\alpha,\beta)) \subseteq V$ there exists an intuitionistic fuzzy g*p- open set U of X such that $c(\alpha,\beta) \subseteq U$ and $f(U) \subseteq V$

Proof *:* Let $c(\alpha,\beta)$ be intuitionistic fuzzy point of X and V be a intuitionistic fuzzy g-open set of Y such that $f(c(\alpha,\beta)) \subseteq V$. Put $U = f^{-1}(V)$. Then by hypothesis U is intuitionistic fuzzy g*p- open set of X such that $c(\alpha,\beta) \subseteq U$ and $f(U) = f(f^{-1}(V)) \subseteq V$.

Theorem 4.3: Let f: $(X,\Im) \to (Y, \sigma)$ is intuitionistic fuzzy g*p- continuous then for each intuitionistic fuzzy point $c(\alpha,\beta)$ of X and each intuitionistic fuzzy open set V of Y such that $f(c(\alpha,\beta))qV$, there exists an intuitionistic fuzzy g*p- open set U of X such that $c(\alpha,\beta)qU$ and $f(U) \subseteq V$.

Proof: Let $c(\alpha,\beta)$ be intuitionistic fuzzy point of X and V be a intuitionistic fuzzy open set of Y such that $f(c(\alpha,\beta))q$ V. Put $U = f^{-1}(V)$. Then by hypothesis U is intuitionistic fuzzy g*p-open set of X such that $c(\alpha,\beta)q$ U and $f(U)= f(f^{-1}(V)) \subseteq V$.

Theorem 4.4: If f: $(X,\Im) \to (Y, \sigma)$ is intuitionistic fuzzy g*p-continuous and g :$(Y, \sigma) \to (Z, \mu)$ is intuitionistic fuzzy continuous. Then gof : $(X,\Im) \to (Z,\mu)$ is intuitionistic fuzzy g*p-continuous.

Proof: Let A is an intuitionistic fuzzy closed set in Z. then $g^{-1}(A)$ is intuitionstic fuzzy closed in Y because g is intuitionistic fuzzy continuous. Therefore $(gof)^{-1}(A) = f^{-1}(g^{-1}(A))$ is intuitionistic fuzzy g*p – closed in X. Hence gof is intuitionistic fuzzy g*p –continuous.

Theorem 4.5: If f : $(X, \Im) \to (Y, \sigma)$ is intuitionistic fuzzy g*p-continuous and g : $(Y,\sigma) \to (Z,\mu)$ is intuitionistic fuzzy g-continuous and (Y,σ) is intuitionistic fuzzy $T_{1/2}$ –space then gof : $(X,\Im) \to (Z,\mu)$ is intuitionistic fuzzy g*p-continuous.

Proof: Let A is an intuitionistic fuzzy closed set in Z, then $g^{-1}(A)$ is intuitionstic fuzzy g-closed in Y. Since Y is intuitionistic fuzzy $T_{1/2}$-space, then $g^{-1}(A)$ is intuitionstic fuzzy closed in Y. Hence $(gof)^{-1}(A) = f^{-1}(g^{-1}(A))$ is intuitionistic fuzzy g*p – closed in X. Hence gof is intuitionistic fuzzy g*p – continuous.

5: APPLICATION OF INTUITIONISTIC FUZZY G*P- CLOSED SETS

In this section we introduce intuitionistic fuzzy T^*_p-space, , intuitionistic fuzzy αT^*_p, and intuitionistic fuzzy αT^{**}_p as an application of intuitionistic fuzzy g*p-closed set. We have derived some characterizations of intuitionistic fuzzy g*p-closed sets.

Definition 5.1: An intuitionistic fuzzy topological space $(X,\Im)$ is called:

(i) an intuitionistic Fuzzy T^*_p-space - if every intuitionistic fuzzy g*p-closet set is intuitionistic fuzzy closed.

(ii) an intuitionistic Fuzzy αT^*_p -space - if every intuitionistic fuzzy g*p-closet set is intuitionistic fuzzy preclosed.

(iii) an intuitionistic Fuzzy αT^{**}_p -space - if every intuitionistic fuzzy g*p-closet set is intuitionistic fuzzy α-closed.

Theorem 5.1*:* Every intuitionistic fuzzy αT^{**}_{p} -space is intuitionistic fuzzy αT^{*}_{p} - space.

Proof: Let (X, $\Im$) be an intuitionistic fuzzy αT^{**}_{p} space and let A be intuitionistic fuzzy g*p-closed set in (X, $\Im$).Then A is intuitionistic Fuzzy α-closed, Since every intuitionistic fuzzy α-closed set is intuitionistic fuzzy pre-closed , A is intuitionistic fuzzy pre closed in topological space (X, $\Im$) . Hence (X, $\Im$) is intutionistic fuzzy αT^{*}_{p} space.

Remark 5.1: The converse of the above theorem need not be true, as seen from the following example

Example *5.1*: Let X = {a, b} and Let $\Im$ = {**0**, O, **1**} be an intuitionistic fuzzy topology on X , where O = {<a ,0.5, 0.5 >,<b ,0.4 ,0.6>}. Then intuitionistic fuzzy topological space (X, $\Im$) is intutionistic fuzzy αT^{*}_{p} space but not intuitionistic fuzzy αT^{**}_{p} -space.

Theorem 5.2: Every intuitionistic fuzzy T^{*}_{p} -space is intuitionistic fuzzy αT^{*}_{p}space.

Proof*:* Let (X, $\Im$) be an intuitionistic fuzzy T^{*}_{p} space and let A be intuitionistic fuzzy g*p-closed set in (X, $\Im$).Then A is intuitionistic fuzzy -closed, Since every intuitionistic fuzzy closed set is intuitionistic fuzzy pre-closed , A is intuitionistic fuzzy pre closed in topological space (X, $\Im$) . Hence (X, $\Im$) is intutionistic fuzzy αT^{*}_{p} space.

Remark 5.2*:* The converse of the above theorem need not be true, as seen from the following example

Example 5.2*:* Let X = {a, b, c} and Let $\Im$ = {**0**, A, B, **1**} be an intuitionistic fuzzy topology on X where A={<a ,0.7, 0.5 >,<b ,0.3 ,0.6>, < c, 1, 0 >} and B={<a ,0.7, 0.3 >,<b ,0.0 ,0.1>, < c, 0, 1>} .Then iintuitionistic fuzzy topological space (X,$\Im$) is αT^{*}_{p} space but not intuitionistic fuzzy T^{*}_{p} -space.

Theorem 5.3: Every intuitionistic fuzzy T^{*}_{p} -space is intuitionistic fuzzy αT^{**}_{p} space.

Proof: Let (X, $\Im$) be an intuitionistic fuzzy T^{*}_{p} space and let A be intuitionistic fuzzy g*p-closed set in (X, $\Im$).Then A is intuitionistic fuzzy -closed, Since every intuitionistic fuzzy closed set is intuitionistic fuzzy α-closed , A is intuitionistic fuzzy α- closed in topological space (X, $\Im$) . Hence (X, $\Im$) is intutionistic fuzzy αT^{**}_{p} space.

Remark 5.3*:* The converse of the above theorem need not be true, as seen from the following example

Example 5.3: Let X = {a, b, c } and Let ℑ = {**0**, A, **1**} be an intuitionistic fuzzy topology on X, where A={<a ,0.6, 0.4 >,<b ,0.3 ,0.6>, < c, 1, 0 >} . Then iintuitionistic fuzzy topological space (X, ℑ) is intutionistic fuzzy αT^{**}_p space but not intuitionistic fuzzy T^*_p -space.

Theorem 5.4: Every intuitionistic fuzzy pre regular $T_{1/2}$ -space is intuitionistic fuzzy αT^*_p space.

Proof: Let (X, ℑ) be an intuitionistic fuzzy pre regular $T_{1/2}$ and let A be intuitionistic fuzzy g*p-closed set in (X, ℑ). Since every intuitionistic fuzzy g*p closed is intuitionistic fuzzy gpr-closed Then A is intuitionistic Fuzzy gpr-closed in(X, ℑ) . Now (X, ℑ) be an intuitionistic fuzzy pre regular $T_{1/2}$ space, Then by definition of intuitionistic fuzzy pre regular $T_{1/2}$ space , A is intuitionistic fuzzy pre closed topological space (X, ℑ) . Hence (X, ℑ) is intutionistic fuzzy αT^*_p space.

Remark 5.4: The converse of the above theorem need not be true, as seen from the following example

Example 5.4*:* Let X = {a, b} and Let ℑ = {**0**, A, B, **1**} be an intuitionistic fuzzy topology on X where A={<a ,0.7, 0.5 >,<b ,0.3 ,0.6>} and B={<a ,0.7, 0.3 >,<b ,0.0 ,0.1>} .Then iintuitionistic fuzzy topological space (X,ℑ) is intutionistic fuzzy αT^*_p space but not intuitionistic fuzzy pre regular$T_{1/2}$ -space.

Theorem 5.5: Every intuitionistic fuzzy semi pre regular $T_{1/2}$ -space is intuitionistic fuzzy αT^*_p fuzzy space.

Proof: Let (X, ℑ) be an intuitionistic fuzzy semi pre regular $T_{1/2}$ and let A be intuitionistic fuzzy g*p-closed set in (X, ℑ). Since every intuitionistic fuzzy g*p closed is intuitionistic fuzzy gspr-closed Then A is intuitionistic Fuzzy gspr-closed in(X, ℑ) . Now (X, ℑ) be an intuitionistic fuzzy semi pre regular $T_{1/2}$ space, Then by definition of intuitionistic fuzzy semi pre regular $T_{1/2}$ space , A is intuitionistic fuzzy closed set in (X, ℑ) . Now every intuitionistic fuzzy closed set is intuitionistic fuzzy pre closed , A is isintuitionistic fuzzy pre-closed set in (X, ℑ) Hence (X, ℑ) is intutionistic fuzzy αT^*_p space.

Remark 5.5: The converse of the above theorem need not be true, as seen from the following example

Example 5.5: Let X = {a, b,c, d } and Let ℑ = {{**0**, A, B, **1**} be an intuitionistic fuzzy topology on X , where A={<a ,0.7, 0.5 >,<b ,0.3 ,0.6>, < c, 1, 0 > < d, 0,1>}

B={<a ,0.7, 0.3 >,<b ,0.0 ,0.1>, < c, 0, 1> <d, 0.5,0.5>} .

Then iintuitionistic fuzzy topological space (X, ℑ) is intutionistic fuzzy αT^*_p space but not intuitionistic fuzzy semi pre regular $T^*{}_{-1/2}$ space.

Theorem 5.6: Every intuitionistic fuzzy $pT_{1/2}$ -space is intuitionistic fuzzy αT^*p - space.

Proof: Let (X, ℑ) be an intuitionistic fuzzy $pT_{1/2}$-space and let A be intuitionistic fuzzy g*p-closed set in (X, ℑ). Since every intuitionistic fuzzy g*p closed is intuitionistic fuzzy gp-closed Then A is intuitionistic Fuzzy gp-closed in(X, ℑ) . Now (X, ℑ) be an intuitionistic fuzzy $pT_{1/2}$ space, Then by definition of intuitionistic fuzzy $pT_{1/2}$ space , A is intuitionistic fuzzy closed set in (X, ℑ) . Now every intuitionistic fuzzy closed set is intuitionistic fuzzy pre closed , A is isintuitionistic fuzzy pre-closed set in (X, ℑ) Hence (X, ℑ) is intutionistic fuzzy αT^*p space.

Remark 5.6: The converse of the above theorem need not be true, as seen from the following example

Example 5.6: Let X = {a, b} and Let ℑ = {**0**, O, **1**} be an intuitionistic fuzzy topology on X , where O={<a ,0.5, 0.5 >,<b ,0.4 ,0.6>}. Then intuitionistic fuzzy topological space (X, ℑ) is intutionistic fuzzy αT^*p - space but not intuitionistic fuzzy $pT_{1/2}$ –space.

CONCLUSION

The theory of g-closed sets plays an important role in general topology. Since its inception many weak and strong forms of g-closed sets have been introduced in general topology as well as fuzzy topology and intuitionistic fuzzy topology. The present paper investigated a new form of intuitionistic fuzzy closed sets called intuitionistic fuzzy g*p-closed sets which contain the classes of intuitionistic fuzzy closed sets, intuitionistic fuzzy pre-closed sets, intuitionistic fuzzy α-closed sets, intuitionistic fuzzy regular closed, intuitionistic fuzzy g*-closed sets, , and contained in the classes of intuitionistic fuzzy gp-closed sets, intuitionistic fuzzy gpr-closed sets , intuitionistic fuzzy gspr-closed sets , intuitionistic fuzzy sgp-and class of all intuitionistic fuzzy gsp-closed sets. Several properties and application of intuitionistic fuzzy g*p--closed sets and intuitionistic fuzzy g*p-continuous mappings are studied. Many examples are given to justify the result.

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