Volume 1, No. 3, March 2013
Journal of Global Research in Mathematical Archives
RESEARCH PAPER
Available online at http://www.jgrma.info
ISSN 2320 – 5822

# INTUITIONISTIC FUZZY CONTRA $\pi$ GENERALIZED SEMI OPEN MAPPINGS IN INTUITIONISTIC FUZZY TOPOLOGICAL SPACES

K.Ramesh[*1] and S.Maragathavalli[2]

[*1]Assistant Professor, Department of Mathematics
S.V.S College of Engineering
Coimbatore, Tamil Nadu (INDIA)
E.mail;rameshfuzzy@gmail.com

[2]Associate Professor, Department of Mathematics
Sree Saraswathi Thyagaraja College
Pollachi, Tamil Nadu (INDIA)
Email: smvalli@rediffmail.com

***Abstract:*** In this paper we introduce intuitionistic fuzzy contra $\pi$ generalized semi open mappings, intuitionistic fuzzy contra $\pi$ generalized semi closed mappings and intuitionistic fuzzy contra M$\pi$ -generalized semi open mappings in intuitionistic fuzzy topological spaces and some of their basic properties are studied.

**Keywords**: Intuitionistic fuzzy topology, intuitionistic fuzzy contra $\pi$ generalized semi open mappings, intuitionistic fuzzy contra $\pi$ generalized semi closed mappings and intuitionistic fuzzy contra M$\pi$ -generalized semi open mappings.

**AMS Subject Classification**: 03F55.

## INTRODUCTION

Zadeh [15] introduced the notion of fuzzy sets. After which there have been a number of generalizations on this fundamental concept. The notion of intuitionistic fuzzy sets introduced by Atanassov [1] is one among them. Using the notion of intuitionistic fuzzy sets, Coker [2] introduced the notion of intuitionistic fuzzy topological space. In this paper we introduce the notion of intuitionistic fuzzy contra $\pi$ generalized semi open mappings and intuitionistic fuzzy contra $\pi$ generalized semi closed mappings. We also introduce intuitionistic fuzzy contra M$\pi$ -generalized semi open mappings.We investigate some of their properties and arrive at some characterizations of intuitionistic fuzzy contra $\pi$ - generalized semi open mappings and intuitionistic fuzzy contra $\pi$ - generalized semi closed mappings.

## PRELIMINARIES

**Definition 2.1:** [1] Let X be a non empty fixed set. An intuitionistic fuzzy set (IFS in short) A in X is an object having the form A = $\{\langle x, \mu_A(x), \nu_A(x) \rangle / x\in X\}$where the values $\mu_A(x)$: X $\rightarrow$ [0, 1] and $\nu_A(x)$: X $\rightarrow$ [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 $0 \leq \mu_A(x) + \nu_A(x) \leq 1$ for each x $\in$ X. Denote the set of all intuitionistic fuzzy sets in X by IFS (X).

**Definition 2.2:** [1] Let A and B be IFS's of the form
A = $\{\langle x, \mu_A(x), \nu_A(x) \rangle / x \in X\}$ and

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) $A \cup B = \{\langle x, \mu_A(x) \vee \mu_B(x), \nu_A(x) \wedge \nu_B(x) \rangle / x \in X\}$.

For the sake of simplicity, we shall use the notation $A = \langle x, \mu_A, \nu_A \rangle$ instead of $A = \{\langle x, \mu_A(x), \nu_A(x) \rangle / x \in X\}$ and $A = \langle x, (\mu_A, \mu_B), (\nu_A, \nu_B) \rangle$ instead of $A = \langle x, (A/\mu_A, B/\mu_B), (A/\nu_A, B/\nu_B) \rangle$. The intuitionistic fuzzy sets $0_\sim = \{\langle x, 0, 1 \rangle / x \in X\}$ and $1_\sim = \{\langle x, 1, 0 \rangle / x \in X\}$ are respectively the empty set and the whole set of X.

**Definition 2.3:** [2] An intuitionistic fuzzy topology (IFT in short) on a non empty set X is a family $\tau$ of IFS in X satisfying the following axioms:

(a) $0_\sim, 1_\sim \in \tau$

(b) $G_1 \cap G_2 \in \tau$, for any $G_1, G_2 \in \tau$

(c) $\cup G_i \in \tau$ for any arbitrary family $\{G_i / i \in J\} \subseteq \tau$.

In this case the pair $(X, \tau)$ is called an intuitionistic fuzzy topological space (IFTS in short) and any IFS in $\tau$ is known as an intuitionistic fuzzy open set (IFOS for short) in X.

The complement $A^c$ of an IFOS A in an IFTS $(X, \tau)$ is called an intuitionistic fuzzy closed set (IFCS for short) in X.

**Definition 2.4:** [2] Let $(X, \tau)$ be an IFTS and $A = \langle x, \mu_A, \nu_A \rangle$ be an IFS in X. Then the intuitionistic fuzzy interior and an intuitionistic fuzzy closure are defined by

$int(A) = \cup \{ G / G$ is an IFOS in X and $G \subseteq A \}$,

$cl(A) = \cap \{ K / K$ is an IFCS in X and $A \subseteq K \}$.

Note that for any IFS A in $(X, \tau)$, we have $cl(A^c) = [int(A)]^c$ and $int(A^c) = [cl(A)]^c$.

**Definition 2.5:** An IFS $A = \langle x, \mu_A, \nu_A \rangle$ in an IFTS $(X, \tau)$ is said to be an
(i) [12]intuitionistic fuzzy semi closed set (IFSCS in short) if $int(cl(A)) \subseteq A$,
(ii) [10]intuitionistic fuzzy $\alpha$-closed set (IF$\alpha$CS in short) if $cl(int(cl(A))) \subseteq A$,
(iii)[11] intuitionistic fuzzy pre closed set (IFPCS in short) if $cl(int(A)) \subseteq A$.
The family of all IFSCSs, IF$\alpha$CSs and IFPCSs (respectively IFSOSs, IF$\alpha$OSs and IFPOSs) of an IFTS $(X, \tau)$ is denoted by IFSC(X), IF$\alpha$C(X) and IFPC(X) (respectively IFSO(X), IF$\alpha$O(X) and IFPO(X)).

**Definition 2.6:** [14] Let A be an IFS in an IFTS $(X, \tau)$. Then
$sint(A) = \cup \{ G / G$ is an IFSOS in X and $G \subseteq A \}$,
$scl(A) = \cap \{ K / K$ is an IFSCS in X and $A \subseteq K \}$.
Note that for any IFS A in $(X, \tau)$, we have $scl(A^c)=(sint(A))^c$ and $sint(A^c) = (scl(A))^c$.

**Definition 2.7: [**13**]** The IFS $c(\alpha, \beta) = \langle x, c_\alpha, c_{1-\beta} \rangle$ where $\alpha \in (0, 1]$, $\beta \in [0, 1)$ and $\alpha + \beta \leq 1$ is called an intuitionistic fuzzy point (IFP) in X.

**Definition 2.8: [**13] Two IFSs are said to be q-coincident ($A\ _q\ B$) if and only if there exists an element $x \in X$ such that $\mu_A(x) > \nu_B(x)$ or $\nu_A(x) < \mu_B(x)$.

**Definition 2.9:**[13] An IFS A in an IFTS $(X, \tau)$ is an intuitionistic fuzzy generalized closed set (IFGCS in short) if $cl(A) \subseteq U$ whenever $A \subseteq U$ and U is an IFOS in X.

**Definition 2.10:**[9] An IFS A in an IFTS $(X, \tau)$ is said to be an intuitionistic fuzzy generalized semi closed set (IFGSCS in short) if $scl(A) \subseteq U$ whenever $A \subseteq U$ and U is an IFOS in $(X, \tau)$.

**Definition 2.11:**[9] An IFS A is said to be an intuitionistic fuzzy generalized semi open set (IFGSOS in short) in X if the complement $A^c$ is an IFGSCS in X.

**Definition 2.12:**[4] An IFS A in an IFTS $(X, \tau)$ is said to be an intuitionistic fuzzy $\pi$- generalized semi closed set (IF$\pi$GSCS in short) if $scl(A) \subseteq U$ whenever $A \subseteq U$ and U is an IF$\pi$OS in $(X, \tau)$.

**Result 2.13**:[8] Every IFCS, IFGCS, IFRCS, IF$\alpha$CS , IFGSCS is an IF$\pi$GSCS but the converses may not be true in general.

 

**Definition 2.14:** [6] Let A be an IFS in an IFTS (X, τ). Then
$\pi$gsint(A) = $\cup$ { G / G is an IF$\pi$GSOS in X and G $\subseteq$ A },
$\pi$gscl(A) = $\cap$ { K / K is an IF$\pi$GSCS in X and A $\subseteq$ K }.

**Definition 2.15:**[5] An IFTS (X, τ) is said to be an intuitionistic fuzzy $\pi T_{1/2}$ (IF$\pi T_{1/2}$ in short) space if every IF$\pi$GSOS in X is an IFOS in X.

**Definition 2.16:**[5] An IFTS (X, τ) is said to be an intuitionistic fuzzy $\pi a T_{1/2}$ (IF$\pi a T_{1/2}$ in short) space if every IF$\pi$GSCS in X is an IFCS in X.

**Definition 2.17:**[5] An IFTS (X, τ) is said to be an intuitionistic fuzzy $\pi b T_{1/2}$ (IF$\pi b T_{1/2}$ in short) space if every IF$\pi$GSCS in X is an IFGCS in X.

**Definition 2.18:**[5] An IFTS (X, τ) is said to be an intuitionistic fuzzy $\pi c T_{1/2}$ (IF$\pi c T_{1/2}$ in short) space if every IF$\pi$GSCS in X is an IFGSCS in X.

## 3. INTUITIONISTIC FUZZY CONTRA $\pi$ GENERALIZED SEMI OPEN MAPPINGS

In this section we have introduced intuitionistic fuzzy contra $\pi$ generalized semi open mappings. We investigated some of its properties.

**Definition 3.1:** A mapping f: X $\rightarrow$ Y is said to be an intuitionistic fuzzy contra $\pi$ generalized semi open mapping (IFC$\pi$GSOM in short) if f(A) is an IF$\pi$GSCS in (Y, σ) for every IFOS A in (X, τ).

**Example 3.2:** Let X = {a, b}, Y = {u, v} and $G_1 = \langle x, (0.5_a, 0.4_b), (0.5_a, 0.6_b)\rangle$, $G_2 = \langle y, (0.6_u, 0.7_v), (0.4_u, 0.3_v)\rangle$. Then τ = {$0_\sim$, $G_1$, $1_\sim$} and σ = {$0_\sim$, $G_2$, $1_\sim$} are IFTs on X and Y respectively. Define a mapping f: (X, τ) $\rightarrow$ (Y,σ) by f (a) = u and f (b) = v. Then f is an IFC$\pi$GSOM.

**Definition 3.3:** A mapping f : (X, τ) $\rightarrow$ (Y,σ) is called an intuitionistic fuzzy contra $\pi$ generalized semi closed mapping (IFC$\pi$GS closed in short) if for every IFCS A of (X, τ), f(A) is an IF$\pi$GSOS in (Y, σ).

**Definition 3.4:** An IFTS (X, τ) is said to be an intuitionistic fuzzy $\pi d T_{1/2}$ (IF$\pi d T_{1/2}$ in short) space if every IF$\pi$GSCS in X is an IFSCS in X.

**Theorem 3.5:** For a bijective mapping f: X $\rightarrow$ Y, where Y is an IF$\pi d T_{1/2}$ space, the following are equivalent.

(i) f is an IFC$\pi$GSOM
(ii) for every IFCS A in X, f(A) is an IF$\pi$GSOS in Y
(iii) for every IFOS B in X, f(B) is an IF$\pi$GSCS in Y
(iv) for any IFCS A in X and for any IFP c(α, β)$\in$ Y, if $f^{-1}$(c(α, β)) $_q$ A, then c(α, β) $_q$ sint(f(A))
(v) For any IFCS A in X and for any c(α, β) $\in$ Y, if $f^{-1}$(c(α, β)) $_q$ A, then there exists an IF$\pi$GSOS B such that c(α, β) $_q$ B and $f^{-1}$(B) $\subseteq$ A.

**Proof:** (i) $\Rightarrow$ (ii) Let A be an IFCS in X. Then $A^c$ is an IFOS in X. By hypothesis, f($A^c$) is an IF$\pi$GSCS in Y. That is $f(A)^c$ is an IF$\pi$GSCS in Y. Hence f(A) is an IF$\pi$GSOS in Y.(ii) $\Rightarrow$ (i) Let A be an IFOS in X. Then $A^c$ is an IFCS in X. By hypothesis, f($A^c$) = $[f(A)]^c$ is an IF$\pi$GSOS in Y. Hence f(A) is an IF$\pi$GSCS in Y. Thus f is an IFC$\pi$GSOM.(ii) $\Leftrightarrow$ (iii) is obvious.(ii) $\Rightarrow$ (iv) Let A $\subseteq$ X be an IFCS and let c(α, β) $\in$ Y. Let $f^{-1}$(c(α, β)) $_q$ A. Then c(α, β) $_q$ f(A). By hypothesis, f(A) is an IF$\pi$GSOS in Y. Since Y is an IF$\pi d T_{1/2}$ space, f(A) is an IFSOS in Y. This implies sint(f(A)) = f(A). Hence c(α, β) $_q$ sint(f(A)). (iv) $\Rightarrow$ (ii) Let A $\subseteq$ X be an IFCS and let c(α, β) $\in$ Y Let $f^{-1}$(c(α, β)) $_q$ A. Then c(α, β) $_q$ f(A). By hypothesis this implies c(α, β) $_q$ sint(f(A)). That is f(A) $\subseteq$ sint(f(A)) $\subseteq$ f(A). Therefore f(A) = sint(f(A)) is an IFSOS in Y and hence an IF$\pi$GSOS in Y. (iv) $\Rightarrow$ (v) Let A $\subseteq$ X be an IFCS and let c(α, β) $\in$ Y. Let $f^{-1}$(c(α, β)) $_q$ A. Then c(α, β) $_q$ f(A). This implies c(α, β) $_q$ sint(f(A)). Thus f(A) is an IFSOS in Y and hence an IF$\pi$GSOS in Y. Let f(A) = B. Therefore c(α, β) $_q$ B and $f^{-1}(B) = f^{-1}(f(A))$ = A, since f is a bijective mapping. (v) ⇒ (iv) Let A ⊆ X be an IFCS and let c(α, β) ∈ Y Let $f^{-1}(c(\alpha, \beta))$ $_q$ A. Then c(α, β) $_q$ f(A). By hypothesis there exists an IF$\pi$GSOS B in Y such that c(α, β) $_q$ B and $f^{-1}(B) \subseteq A$. Let B = f(A). Then c(α, β) $_q$ f(A). Since Y is an IF$\pi d T_{1/2}$ space, f(A) is an IFSOS in Y. Therefore c(α, β) $_q$ sint(f(A)).

**Theorem 3.6:** Let f: X → Y be a bijective mapping. Suppose that one of the following properties hold.

(i) $f^{-1}(scl(A)) \subseteq int(f^{-1}(A))$ for each IFS A in Y

(ii) scl(f (B)) ⊆ f (int(B)) for each IFS B in X

(iii) f(cl(B)) ⊆ sint(f(B)) for each IFS B in X

Then f is an IFC$\pi$GSOM.

**Proof:** (i) ⇒ (ii) Let B ⊆ X. Then f(B) is an IFS in Y. By hypothesis, $f^{-1}(scl(f(B))) \subseteq int(f^{-1}(f(B)))$ = int(B). Now scl(f(B)) = $f(f^{-1}(scl(f(B)))) \subseteq$ f (int(B)). (ii) ⇒ (iii) is obvious by taking complement in (ii). Suppose (iii) holds. Let A be an IFCS in X. Then cl(A) = A and f(A) is an IFS in Y. Now f(A) = f(cl(A)) ⊆ sint(f(A)) ⊆ f(A), by hypothesis. This implies f(A) is an IFSOS in Y and hence an IF$\pi$GSOS in Y. Thus f is an IFC$\pi$GSOM by Theorem 3.5.

**Theorem 3.7:** Let f: X → Y be a bijective mapping. Then f is an IFC$\pi$GSOM if $cl(f^{-1}(A)) \subseteq f^{-1}(sint(A))$ for every IFS A in Y.

**Proof:** Let A be an IFCS in X. Then cl(A) = A and f(A) is an IFS in Y. By hypothesis $cl(f^{-1}(f(A))) \subseteq f^{-1}(sint(f(A)))$. Since f is one to one $f^{-1}(f(A))$ = A. Therefore A = cl(A) = $cl(f^{-1}(f(A))) \subseteq f^{-1}(sint(f(A)))$. Now f(A) ⊆ $f(f^{-1}(sint(f(A)))$ = sint(f(A)) ⊆ f(A). Hence f(A) is an IFSOS in Y and hence an IF$\pi$GSOS in Y. Thus f is an IFC$\pi$GSOM by Theorem 3.5.

**Theorem 3.8:** If f: X → Y is an IFC$\pi$GSOM, where Y is an IF$\pi d T_{1/2}$ space, then the following conditions hold.

(i) scl(f(B)) ⊆ f(int(scl(B))) for every IFOS B in X

(ii) f(cl(sint(B))) ⊆ sint(f(B)) for every IFCS B in X

**Proof:** (i) Let B ⊆ X be an IFOS. Then int(B) = B. By hypothesis f (B) is an IF$\pi$GSCS in Y. Since Y is an IF$\pi d T_{1/2}$ space, f(B) is an IFSCS in Y. This implies scl(f(B)) = f(B) = f(int(B)) ⊆ f(int(scl(B))).

(ii) can be proved easily by taking complement in (i).

**Theorem 3.9:** A mapping f: X → Y is an IFC$\pi$GSOM if f(scl(B)) ⊆ int(f(B)) for every IFS B in X.

**Proof:** Let B ⊆ X be an IFCS. Then cl(B) = B. Since every IFCS is an IFSCS, scl(B) = B. Now by hypothesis, f(B) = f(scl(B)) ⊆ int(f(B)) ⊆ f(B). This implies f(B) is an IFOS in Y. Therefore f(B) is an IF$\pi$GSOS in Y. Hence f is an IFC$\pi$GSOM.

**Theorem 3.10:** A mapping f : X → Y is an IFC$\pi$GSOM, where Y is an IF$\pi d T_{1/2}$ space if and only if f(scl(B)) ⊆ sint(f(cl(B))) for every IFS B in X.

**Proof: Necessity:** Let B ⊆ X be an IFS. Then cl(B) is an IFCS in X. By hypothesis, f(cl(B)) is an IF$\pi$GSOS in Y. Since Y is an IF$\pi d T_{1/2}$ space, f(cl(B)) is an IFSOS in Y. Therefore f(scl(B)) ⊆ f(cl(B)) = sint(f(cl(B))).

**Sufficiency:** Let B ⊆ X be an IFCS. Then cl(B) = B. By hypothesis, f(scl(B)) ⊆ sint(f(cl(B))) = sint(f(B)). But scl(B) = B. Therefore f(B) = f(scl(B)) ⊆ sint(f(B) ⊆ f(B). This implies f(B) is an IFSOS in Y and hence an IF$\pi$GSOS in Y. Hence f is an IFC$\pi$GSOM.

**Theorem 3.11:** An IFOM f: X → Y is an IFC$\pi$GSOM if IF$\pi$GSO(Y) = IF$\pi$GSC(Y).

**Proof:** Let A ⊆ X be an IFOS. By hypothesis, f(A) is an IFOS in Y and hence is an IF$\pi$GSOS in Y. By assumption f(A) is an IF$\pi$GSCS in Y. Therefore f is an IFC$\pi$GSOM.

**Definition 3.12:** A mapping f: X → Y is said to be an intuitionistic fuzzy contra M$\pi$-generalized semi open mapping (IFCM$\pi$GSOM) if f(A) is an IF$\pi$GSCS in Y for every IF$\pi$GSOS A in X.

**Example 3.13:** Let X = {a, b}, Y = {u, v} and $G_1 = \langle x, (0.5_a, 0.6_b), (0.5_a, 0.4_b)\rangle$, $G_2 = \langle y, (0.2_u, 0.3_v), (0.8_u, 0.7_v)\rangle$. Then τ = {$0_\sim$, $G_1$, $1_\sim$} and σ = {$0_\sim$, $G_2$, $1_\sim$} are IFTs on X and Y respectively. Define a mapping f: (X, τ) → (Y, σ) by f (a) = u and f (b) = v. Then f is an IFCM$\pi$GSOM.

**Theorem 3.14:** Let f: X → Y be a bijective mapping. Then the following are equivalent.

(i) f is an IFCM$\pi$GSOM

(ii) f(A) is an IF$\pi$GSOS in Y for every IF$\pi$GSCS A in X

 

**Proof:** (i) $\Rightarrow$ (ii) Let A be an IF$\pi$GSCS in X. Then $A^c$ is an IF$\pi$GSOS in X. By hypothesis, $f(A^c)$ is an IF$\pi$GSCS in Y. That is $f(A)^c$ is an IF$\pi$GSCS in Y. Hence f(A) is an IF$\pi$GSOS in Y. (ii)$\Rightarrow$ (i) Let A be an IF$\pi$GSOS in X. Then $A^c$ is an IF$\pi$GSCS in X. By hypothesis, $f(A^c) = [f(A)]^c$ is an IF$\pi$GSOS in Y. Hence f(A) is an IF$\pi$GSCS in Y. Thus f is an IFCM$\pi$GSOM.

**Theorem 3.15:** Let f : $(X, \tau) \to (Y, \sigma)$ be a mapping from an IFTS X into an IFTS Y. Then the following conditions are equivalent if Y is an IF$\pi_a T_{1/2}$ space:

(i) f is an IFC$\pi$GSCM
(ii) f is an IFC$\pi$GSOM
(iii) $int(cl(f(A))) \subseteq (f(A))$ for every IFOS A in X.

**Proof:** (i) $\Rightarrow$ (ii): It is obviously true. (ii) $\Rightarrow$ (iii): Let A be an IFOS in X. Then f(A) is an IF$\pi$GSCS in Y. Since Y is an IF$\pi_a T_{1/2}$ space, f(A) is an IFCS in Y. Therefore cl(f(A)) = f(A). This implies $int(cl(f(A))) \subseteq f(A)$. (iii) $\Rightarrow$ (i): Let A be an IFCS in X. Then its complement $A^c$ is an IFOS in X. By hypothesis, $int(cl(f(A^c))) \subseteq f(A^c)$. Hence $f(A^c)$ is an IFSCS in Y. Since every IFSCS is an IF$\pi$GSCS, $f(A^c)$ is an IF$\pi$GSCS in X. Therefore f(A) is an IF$\pi$GSOS in X. Hence f is an IFC$\pi$GSOM.

**Theorem 3.16:** Every IFCM$\pi$GSOM is an IFC$\pi$GSOM but not conversely.
**Proof:** Let f: X $\to$ Y be an IFCM$\pi$GSOM. Let A $\subseteq$ X be an IFOS. Then A is an IF$\pi$GSOS in X. By hypothesis, f(A) is an IF$\pi$GSCS in Y. Hence f is an IFC$\pi$GSOM.

**Example 3.17:** Let X = {a, b}, Y = {u, v} and $G_1 = \langle x, (0_a, 0.3_b), (0.5_a, 0.4_b)\rangle$ ,$G_2 = \langle y, (0.2_u, 0.4_v), (0.5_u, 0.4_v)\rangle$ , $G_3 = \langle y, (0.1_u, 0.3_v), (0.3_u, 0.4_v)\rangle$ ,$G_4 = \langle y, (0.1_u, 0.3_v), (0.5_u, 0.4_v)\rangle$, $G_5 = \langle y, (0.2_u, 0.4_v), (0.3_u, 0.4_v)\rangle$ and $G_6 = \langle y, (0.4_u, 0.4_v), (0.3_u, 0.4_v)\rangle$. Then $\tau = \{0_\sim, G_1, 1_\sim\}$ and $\sigma = \{0_\sim, G_2, G_3, G_4, G_5, G_6, 1_\sim\}$ are IFTs on X and Y respectively. Define a mapping f: $(X, \tau) \to (Y, \sigma)$ by f(a) = u and f(b) = v. Then f is an IFC$\pi$GSOM but not an IFCM$\pi$GSOM, since $A = \langle x, (0_a, 0.3_b), (0.5_a, 0.4_b)\rangle$ is an IF$\pi$GSOS in X but f(A) $= \langle y, (0_u, 0.3_v), (0.5_u, 0.4_v)\rangle$ is not an IF$\pi$GSCS in Y.

**Theorem 3.18:** (i) If f: X $\to$ Y is an IFOM and g: Y $\to$ Z be an IFC$\pi$GSOM, then g o f is an IFC$\pi$GSOM.
(ii) If f: X $\to$ Y is an IFC$\pi$GSOM and g: Y $\to$ Z is an IFM$\pi$GSCM, then g o f is an IFC$\pi$GSOM.
(iii) If f: X $\to$ Y is an IF$\pi$GSOM and g: Y $\to$ Z is an IFCM$\pi$GSOM, then g o f is an IFC$\pi$GSOM.
(iv) If f: X $\to$ Y is an IFC$\pi$GSOM and g: Y $\to$ Z is an IFCM$\pi$GSOM, then g o f : X $\to$ Z is an IF$\pi$GSOM.
**Proof:** (i) Let A be an IFOS in X. Then f(A) is an IFOS in Y. Therefore g(f(A)) is an IF$\pi$GSCS in Z. Hence g o f is an IFC$\pi$GSOM.
(ii) Let A be an IFOS in X. Then f(A) is an IF$\pi$GSCS in Y. Therefore g(f(A)) is an IF$\pi$GSCS in Z. Hence g o f is an IFC$\pi$GSOM
(iii) Let A be an IFOS in X. Then f(A) is an IF$\pi$GSOS in Y. Therefore g(f(A)) is an IF$\pi$GSCS in Z. Hence g o f is an IFC$\pi$GSOM.
(iv) Let A be an IFOS in X. Then f(A) is an IF$\pi$GSCS in Y, since f is an IFC$\pi$GSOM. Since g is an IFCM$\pi$GSOM, g(f(A)) is an IF$\pi$GSOS in Z. Therefore g o f is an IF$\pi$GSOM.

**Theorem 3.19:** If f: X $\to$ Y is an IFCM$\pi$GSOM, then for any IF$\pi$GSCS A in X and for any IFP $c(\alpha, \beta) \in Y$, if $f^{-1}(c(\alpha, \beta))\ _q\ A$, then $c(\alpha, \beta)\ _q\ \pi gsint(f(A))$.
**Proof:** Let A $\subseteq$ X be an IF$\pi$GSPCS and let $c(\alpha, \beta) \in Y$. Let $f^{-1}(c(\alpha, \beta))\ _q\ A$. Then $c(\alpha, \beta)\ _q\ f(A)$. By hypothesis, f(A) is an IF$\pi$GSOS in Y. This implies $\pi gsint(f(A)) = f(A)$. Hence $c(\alpha, \beta)\ _q\ \pi gsint(f(A))$.

**Theorem 3.20:** If f : $(X, \tau) \to (Y, \sigma)$ is an IFC$\pi$GS closed mapping and Y is an IF$\pi_b T_{1/2}$ space, then f(A) is an IFGOS in Y for every IFCS A in X.
**Proof:** Let f : $(X, \tau) \to (Y, \sigma)$ be an IFC$\pi$GS closed mapping and let A be an IFCS in X. Then by hypothesis f(A) is an IF$\pi$GSOS in Y. Since Y is an IF$\pi_b T_{1/2}$ space, f(A) is an IFGOS in Y.

## REFERENCES


[1] K.Atanassov, Intuitionistic fuzzy sets, Fuzzy Sets and Systems, 20 (1986), 87-96.

[2] D.Coker , An introduction to intuitionistic fuzzy topological spaces**,** Fuzzy sets and systems, 88(1997), 81-89.

[3] Joung Kon Jeon, Young Bae Jun, and Jin Han Park, Intuitionistic fuzzy alpha continuity and intuitionistic fuzzy pre continuity, Int. J. Math. Math. Sci., 19 (2005), 3091-3101.

[4] S.Maragathavalli and K.Ramesh , Intuitionistic fuzzy π - generalized semi closed sets, Adv. Theor. Appl. Math., 1 (2012), 33-42.

[5] S.Maragathavalli and K.Ramesh , $\pi$- generalized semi closed mappings in intuitionistic fuzzy Topological spaces, J. Adv. Stud. Topol., Vol.3, No.4, (2012) ,111-118.

[6] S.Maragathavalli and K.Ramesh , A note on intuitionistic fuzzy π - generalized semi irresolute mappings, international journal of mathematical Archive, Vol.3, No.3, (2012),1-7.

[7] S.Maragathavalli and K.Ramesh , Intuitionistic fuzzy completely π - generalized semi continuous mappings in topological spaces, Int.J.Cotemp.Math. Sciences, Vol.8, No.1, (2013),1-13.

[8] S.Maragathavalli and K.Ramesh , Intuitionistic fuzzy almost π - generalized semi open mappings in topological spaces, Gen.Math.Notes, 2(2012),47-59.

[9] S.Maragathavalli and K.Ramesh , On almost π - generalized semi continuous mappings in intuitionistic fuzzy topological spaecs, Mathematical Theory and Modeling, Vol.2, No.4, (2012),18-28.

[10] Shanthi.R and Sakthivel.K, Intuitionistic fuzzy Generalized Semi Continuous Mappings, Adv. Theor. Appl. Math., 5(2009). 73-82.

[11] R.Shanthi and D.Jayanthi , Intuitionistic fuzzy generalized semi Pre Continuous mappings, Int.J.Cotemp.Math. Sciences . Vol.5, No.30, (2010),1455-1469.

[12] K.Sakthivel , Intuitionistic fuzzy alpha generalized continuous mappings and Intuitionistic alpha generalized irresolute mappings, Int.J.Cotemp.Math. Sciences . Vol.4, No.37, (2010),1831-1842.

[13] S.S.Thakur , and Rekha Chaturvedi, Regular generalized closed sets in intuitionistic fuzzy topological spaces, Universitatea Din Bacau Studii Si Cercetari Stiintifice, 6 (2006), 257-272.

[14] Young Bae Jun and Seok- Zun Song, Intuitionistic fuzzy semi-pre open sets and Intuitionistic semi-pre continuos mappings, jour. of Appl. Math and comput., 19(2005), 467-474.

[15] L.A.Zadeh , Fuzzy sets, Inform. Control, 8 (1965), 338-353.

 