Notes on Intuitionistic Fuzzy Sets
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Intuitionistic fuzzy almost β generalized continuous mappings

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Abstract: In this paper, we introduce the notion of intuitionistic fuzzy almost β generalized continuous mappings. Furthermore we provide some properties of the same set and discuss some fascinating theorems.

Keywords: Intuitionistic fuzzy sets, Intuitionistic fuzzy topology, Intuitionistic fuzzy β generalized closed sets, Intuitionistic fuzzy β generalized open sets, Intuitionistic fuzzy almost β generalized continuous mappings.
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1 Introduction

Atanassov [1] introduced the idea of intuitionistic fuzzy sets using the notion of fuzzy sets. Coker [2] introduced intuitionistic fuzzy topological spaces using the notion of intuitionistic fuzzy sets. Later this was followed by the introduction of intuitionistic fuzzy β generalized closed sets by Saranya, M and Jayanthi, D [9] in 2016 which was simultaneously followed by the introduction of intuitionistic fuzzy β generalized continuous mappings [12] by the same authors. We now extend our idea towards intuitionistic fuzzy almost β generalized continuous mappings and discuss some of their properties.

2 Preliminaries

Definition 2.1 [1]: An ***intuitionistic fuzzy set*** (IFS for short) A is an object having the form $A = \{\langle x, \mu_A(X), \nu_A(X)\rangle : x \in X\}$, where the functions $\mu_A : X \to [0, 1]$ and $\nu_A : X \to [0, 1]$ 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 by IFS(X), the set of all intuitionistic fuzzy sets in X.

An intuitionistic fuzzy set A in X is simply denoted by $A = \langle x, \mu_A, \nu_A\rangle$ instead of denoting $A = \{\langle x, \mu_A(X), \nu_A(X)\rangle: x \in X\}$.

Definition 2.2 [1]: Let A and B be two IFSs of the form $A = \{\langle x, \mu_A(X), \nu_A(X)\rangle: x \in \mathrm{X}\}$ and $B = \{\langle x, \mu_B(X), \nu_B(X)\rangle : x \in \mathrm{X}\}$. 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 $A \subseteq \mathrm{B}$ and $A \supseteq \mathrm{B}$,

(c) $A^c = \{\langle x, \nu_A(X), \mu_A(X)\rangle : x \in X\}$,

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

(e) $A \cap B = \{\langle x, \mu_A(X) \wedge \mu_B(X), \nu_A(X) \vee \nu_B(X)\rangle: x \in \mathrm{X}\}$.

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

Definition 2.3 [3]: An ***intuitionistic fuzzy topology*** (IFT in short) on X is a family τ of IFSs in X satisfying the following axioms:

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

(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 $\{G_i : i \in J\} \subseteq \tau$.

In this case the pair (X, τ) is called ***intuitionistic fuzzy topological space*** (IFTS in short) and any IFS in τ is known as an ***intuitionistic fuzzy open set*** (IFOS in short) in X. The complement A^c of an IFOS A in an IFTS (X, τ) is called an ***intuitionistic fuzzy closed set*** (IFCS in short) in X.

Definition 2.4 [8]: An IFS A is said to be an intuitionistic fuzzy dense (IFD for short) in another IFS B in an IFTS (X, τ), if $\mathrm{cl}(A) = \mathrm{B}$.

Definition 2.5 [9]: An IFS A in an IFTS (X, τ) is said to be an ***intuitionistic fuzzy β generalized closed set*** (IFβGCS for short) if $\beta\mathrm{cl}(A) \subseteq \mathrm{U}$ whenever $A \subseteq \mathrm{U}$ and U is an IFβOS in (X, τ).

Definition 2.6 [11]: If every IFβGCS in (X, τ) is an IFβCS in (X, τ), then the space can be called as an intuitionistic fuzzy β generalized $\mathrm{T}_{1/2}$ space (IF$\beta_g\mathrm{T}_{1/2}$ in short).

Definition 2.7 [12]: A mapping f: $(X, \tau) \to (Y, \sigma)$ is called an ***intuitionistic fuzzy β generalized continuous*** (IFβG continuous for short) **mapping** if $f^{-1}(V)$ is an IFβGCS in (X, τ) for every IFCS V of (Y, σ).

3 Intuitionistic fuzzy almost β generalized continuous mappings

In this section we introduce intuitionistic fuzzy almost β generalized continuous mappings and investigated some of their properties.

Definition 3.1: *A* mapping f: $(X, \tau) \to (Y, \sigma)$ is said to be an ***intuitionistic fuzzy almost β generalized continuous*** (IFaβG continuous for short) **mapping** if $f^{-1}(A)$ is an IFβGCS in X for every IFRCS A in Y.

We use the notation $A = \langle x, (\mu_a, \mu_b), (\nu_a, \nu_b)\rangle$ instead of $A = \langle x, (a/\mu_a, b/\mu_b), (a/\nu_a, b/\nu_b)\rangle$ in the following examples.

Example 3.2: Let $X = \{a, b\}$, $Y = \{u, v\}$ and $G_1 = \langle x, (0.5_a, 0.4_b), (0.5_a, 0.6_b)\rangle$, $G_2 = \langle y, (0.3_u, 0.2_v), (0.7_u, 0.8_v)\rangle$. Then $\tau = \{0\sim, G_1, 1\sim\}$ and $\sigma = \{0\sim, G_2, 1\sim\}$ 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, IFβC(X) = $\{0\sim, 1\sim, \mu_a \in [0, 1], \mu_b \in [0, 1], \nu_a \in [0, 1], \nu_b \in [0, 1] /0 \leq \mu_a + \nu_a \leq 1$ and $0 \leq \mu_b + \nu_b \leq 1\}$,

IFβO(X) = $\{0\sim, 1\sim, \mu_a \in [0, 1], \mu_b \in [0, 1], \nu_a \in [0, 1], \nu_b \in [0, 1] /0 \leq \mu_a + \nu_a \leq 1$ and $0 \leq \mu_b + \nu_b \leq 1\}$.

Now $G_2^c = \langle y, (0.7_u, 0.8_v), (0.3_u, 0.2_v)\rangle$ is an IFRCS in Y, Since $cl(int(G_2^c)) = cl(G_2) = G_2^c$. We have $f^{-1}(G_2^c) = \langle x, (0.7_a, 0.8_b), (0.3_a, 0.2_b)\rangle$ is an IFS in X. Now $f^{-1}(G_2^c) \subseteq 1\sim$. As $\beta cl(f^{-1}(G_2^c)) = f^{-1}(G_2^c) \subseteq 1\sim$, $f^{-1}(G_2^c)$ is an IFβGCS in X. Thus f is an IFaβG continuous mapping.

Remark 3.3: Every IF continuous mapping, IFα continuous mapping, IFS continuous mapping, IFSP continuous mapping, IFP continuous mapping, IFβ continuous mapping and IFβG continuous mapping are IFaβG continuous mapping but the converses are not true in general.

Example 3.4: In Example 3.2, f is an IFaβG continuous mapping but not an IF continuous mapping, IFS continuous mapping, IFα continuous mapping and IFSP continuous mapping.

Example 3.5: Let $X = \{a, b\}$, $Y = \{u, v\}$ and $G_1 = \langle x, (0.5_a, 0.6_b), (0.5_a, 0.4_b)\rangle$, $G_2 = \langle y, (0.5_u, 0.3_v), (0.5_u, 0.7_v)\rangle$. Then $\tau = \{0\sim, G_1, 1\sim\}$ and $\sigma = \{0\sim, G_2, 1\sim\}$ are IFTs on X and Y respectively. Define a mapping f: $(X, \tau) \to (Y, \sigma)$ by f(a) = u and f(b) = v. The IFS $G_2^c = \langle y, (0.5_u, 0.7_v), (0.5_u, 0.3_v)\rangle$ is an IFCS in Y.

Then, IFβC(X) = $\{0\sim, 1\sim, \mu_a \in [0, 1], \mu_b \in [0, 1], \nu_a \in [0, 1], \nu_b \in [0, 1] / \mu_b < 0.6$ whenever $\mu_a \geq 0.5$, $\mu_a < 0.5$ whenever $\mu_b \geq 0.6$, $0 \leq \mu_a + \nu_a \leq 1$ and $0 \leq \mu_b + \nu_b \leq 1\}$,

IFβO(X) = $\{0\sim, 1\sim, \mu_a \in [0, 1], \mu_b \in [0, 1], \nu_a \in [0, 1], \nu_b \in [0, 1]$ / either $\mu_a > 0.5$ or $\mu_b > 0.4$, and $0 \leq \mu_a + \nu_a \leq 1$ and $0 \leq \mu_b + \nu_b \leq 1\}$.

Now $G_2^c = \langle y, (0.5_u, 0.7_v), (0.5_u, 0.3_v)\rangle$ is an IFRCS in Y, since $cl(int(G_2^c)) = cl(G_2) = G_2^c$. We have $f^{-1}(G_2^c) = \langle x, (0.5_a, 0.7_b), (0.5_a, 0.3_b)\rangle$ is an IFS in X. Now $f^{-1}(G_2^c) \subseteq 1\sim$. As $\beta cl(f^{-1}(G_2^c) = 1\sim \subseteq 1\sim$, $f^{-1}(G_2^c)$ is an IFβGCS in X but not an IFPCS in X, since $cl(int(f^{-1}(G_2^c))) = cl(G_1) = 1\sim \not\subseteq f^{-1}(G_2^c)$. Therefore f is an IFaβG continuous mapping but not an IFP continuous mapping.

Example 3.6: Let $X = \{a, b\}$, $Y = \{u, v\}$ and $G_1 = \langle x, (0.5_a, 0.7_b), (0.5_a, 0.3_b)\rangle$, $G_2 = \langle y, (0.5_u, 0.2_v), (0.5_u, 0.8_v)\rangle$. Then $\tau = \{0_\sim, G_1, 1_\sim\}$ and $\sigma = \{0_\sim, G_2, 1_\sim\}$ 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, IFβC(X) = $\{0_\sim, 1_\sim, \mu_a \in [0, 1], \mu_b \in [0, 1], \nu_a \in [0, 1], \nu_b \in [0, 1]$ / provided either $\mu_b < 0.7$ whenever $\mu_a \geq 0.5$ or $\mu_a < 0.5$ whenever $\mu_b \geq 0.7$, $0 \leq \mu_a + \nu_a \leq 1$ and $0 \leq \mu_b + \nu_b \leq 1\}$.

IFβO(X) = $\{0_\sim, 1_\sim, \mu_a \in [0, 1], \mu_b \in [0, 1], \nu_a \in [0, 1], \nu_b \in [0, 1]$ / either $\mu_a > 0.5$ or $\mu_b > 0.3$, $0 \leq \mu_a + \nu_a \leq 1$ and $0 \leq \mu_b + \nu_b \leq 1\}$.

Now $G_2^c = \langle y, (0.5_u, 0.8_v), (0.5_u, 0.2_v)\rangle$ is an IFRCS in Y, Since $cl(int(G_2^c)) = cl(G_2) = G_2^c$. We have $f^{-1}(G_2^c) = \langle x, (0.5_a, 0.8_b), (0.5_a, 0.2_b)\rangle$ is an IFS in X. Now $f^{-1}(G_2^c) \subseteq 1_\sim$. As $\beta cl(f^{-1}(G_2^c) = 1_\sim \subseteq 1_\sim$, $f^{-1}(G_2^c)$ is an IFβGCS in X but not an IFβCS in X, since $int(cl(int(f^{-1}(G_2^c)))) = int(cl(G_1)) = int(1_\sim) = 1_\sim \nsubseteq f^{-1}(G_2^c)$. Therefore f is an IFaβG continuous mapping but not an IFβ continuous mapping.

Example 3.7: Let $X = \{a, b\}$, $Y = \{u, v\}$ and $G_1 = \langle x, (0.5_a, 0.7_b), (0.2_a, 0.1_b)\rangle$, $G_2 = \langle y, (0.2_u, 0.2_v), (0.5_u, 0.8_v)\rangle$ and $G_3 = \langle y, (0.2_u, 0.2_v), (0.5_u, 0.6_v)\rangle$. Then $\tau = \{0_\sim, G_1, 1_\sim\}$ and $\sigma = \{0_\sim, G_2, G_3, 1_\sim\}$ are IFTs on X and Y, respectively. Define a mapping f: $(X, \tau) \to (Y, \sigma)$ by $f(a) = u$ and $f(b) = v$.

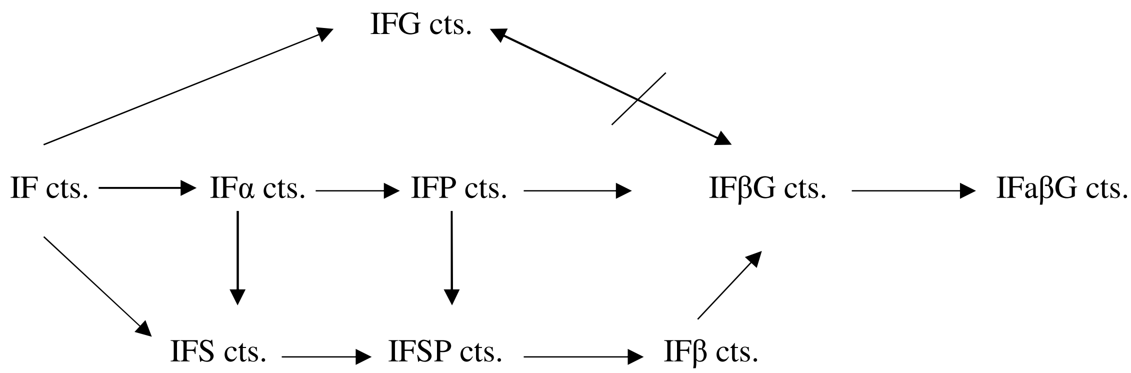
Then, IFβC(X) = $\{0_\sim, 1_\sim, \mu_a \in [0, 1], \mu_b \in [0, 1], \nu_a \in [0, 1], \nu_b \in [0, 1]$ / either $\mu_a < 0.5$ or $\mu_b < 0.7$, $\leq \mu_a + \nu_a \leq 1$ and $0 \leq \mu_b + \nu_b \leq 1\}$.

IFβO(X) = $\{0_\sim, 1_\sim, \mu_a \in [0, 1], \mu_b \in [0, 1], \nu_a \in [0, 1], \nu_b \in [0, 1]$ / either $\mu_a > 0.2$ or $\mu_b > 0.1$, $0 \leq \mu_a + \nu_a \leq 1$ and $0 \leq \mu_b + \nu_b \leq 1\}$.

Now $G_3^c = \langle y, (0.5_u, 0.6_v), (0.2_u, 0.2_v)\rangle$ is an IFRCS in Y, Since $cl(int(G_3^c)) = cl(G_3) = G_3^c$. We have $f^{-1}(G_3^c) = \langle x, (0.5_a, 0.6_b), (0.2_a, 0.2_b)\rangle \subseteq G_1$ and $\beta cl(f^{-1}(G_3^c)) = f^{-1}(G_3^c) \subseteq G_1$. Hence $f^{-1}(G_3^c)$ is an IFβGCS in X. Thus f is an IFaβG continuous mapping.

We have $G_2^c = \langle y, (0.5_u, 0.8_v), (0.2_u, 0.2_v)\rangle$ is IFCS in Y. We have $\beta cl(f^{-1}(G_2^c)) = 1_\sim \nsubseteq G_1$. Hence $f^{-1}(G_2^c)$ is not an IFβGCS in X. Thus f is not an IFβG continuous mapping.

The relation between various types of intuitionistic fuzzy continuity is given in the following diagram. In this diagram 'cts.' means continuous.



The reverse implications are not true in general in the above diagram.

Theorem 3.8: A mapping $f : (X, \tau) \to (Y, \sigma)$ is an IFaβG continuous mapping if and only if the inverse image of each IFROS in Y is an IFβGOS in X.

Proof: (Necessity): Let A be an IFROS in Y. This implies A^c is IFRCS in Y. Since f is an IFaβG continuous mapping, $f^{-1}(A^c)$ is an IFβGCS in X. Since $f^{-1}(A^c) = (f^{-1}(A))^c$, $f^{-1}(A)$ is an IFβGOS in X.

(Sufficiency): Let A be an IFRCS in Y. This implies A^c is an IFROS in Y. By hypothesis, $f^{-1}(A^c)$ is an IFβGOS in X. Since $f^{-1}(A^c) = (f^{-1}(A))^c$, $f^{-1}(A)$ is an IFβGCS in X. Hence f is an IFaβG continuous mapping. □

Theorem 3.9: Let $p_{(\alpha,\beta)}$ be an intuitionistic fuzzy point (IFP in short) [4] in X. A mapping $f : (X, \tau) \to (Y, \sigma)$ is an IFaβG continuous mapping if for every IFOS A in Y with $p_{(\alpha,\beta)} \in A$, there exists an IFOS B in X with $p_{(\alpha,\beta)} \in B$ such that $f^{-1}(A)$ is intuitionistic fuzzy dense [8] in B.

Proof: Let A be an IFROS in Y. Then A is an IFOS in Y. Let $p_{(\alpha,\beta)} \in A$, then there exists an IFOS B in X such that $p_{(\alpha,\beta)} \in B$ and $cl(f^{-1}(A)) = B$. Therefore $cl(f^{-1}(A)) = B$ is also an IFOS in X and $int(cl(f^{-1}(A))) = cl(f^{-1}(A))$.

Now $f^{-1}(A) \subseteq cl(f^{-1}(A)) = int(cl(f^{-1}(A))) \subseteq cl(int(cl(f^{-1}(A))))$. This implies $f^{-1}(A)$ is an IFβOS in X and hence an IFβGOS in X. Thus f is an IFaβG continuous mapping. □

Theorem 3.10: Let $f : (X, \tau) \to (Y, \sigma)$ be a mapping. If $f^{-1}(\beta int(B)) \subseteq \beta int(f^{-1}(B))$ for every IFS B in Y, then f is an IFaβG continuous mapping.

Proof: Let $B \subseteq Y$ be an IFROS. By hypothesis, $f^{-1}(\beta int(B)) \subseteq \beta int(f^{-1}(B))$. Since B is IFROS, it is an IFβOS in Y. Therefore $\beta int(B) = B$. Hence $f^{-1}(B) = f^{-1}(\beta int(B)) \subseteq \beta int(f^{-1}(B)) \subseteq f^{-1}(B)$. This implies $f^{-1}(B)$ is an IFβOS in X and hence $f^{-1}(B)$ is an IFβGOS [10] in X. Thus f is an IFaβG continuous mapping. □

Remark 3.11: The converse of the above theorem is true if $B \subseteq Y$ is an IFROS and X is an IF$\beta_g T_{1/2}$ space.

Proof: Let f be an IFaβG continuous mapping. Let B be an IFROS in Y then by hypothesis $f^{-1}(B)$ is an IFβGOS in X. Since X is an IF$\beta_g T_{1/2}$ space, $f^{-1}(B)$ is an IFβOS in X. Therefore, $f^{-1}(\beta int(B)) \subseteq f^{-1}(B) = \beta int(f^{-1}(B))$. □

Theorem 3.12: Let $f : (X, \tau) \to (Y, \sigma)$ be a mapping. If $\beta cl(f^{-1}(B)) \subseteq f^{-1}(\beta cl(B))$for every IFS B in Y, then f is an IFaβG continuous mapping.

Proof: Let $B \subseteq Y$ be an IFRCS. By hypothesis, $\beta cl(f^{-1}(B)) \subseteq f^{-1}(\beta cl(B))$. Since B is an IFRCS, it is an IFβCS in Y. Therefore $\beta cl(B) = B$. Hence $f^{-1}(B) = f^{-1}(\beta cl(B)) \supseteq \beta cl(f^{-1}(B)) \supseteq f^{-1}(B)$. This implies $f^{-1}(B)$ is an IFβCS in X and hence $f^{-1}(B)$ is an IFβGCS [9] in X. Thus f is an IFaβG continuous mapping. □

Remark 3.13: The converse of the above theorem is true if $B \subseteq Y$ is an IFRCS and X is an IF$\beta_g T_{1/2}$ space.

Proof: Let f be an IFaβG continuous mapping. Let B be an IFRCS in Y then by hypothesis $f^{-1}(B)$ is an IFβGCS in X. Since X is an IF$\beta_g T_{1/2}$ space, $f^{-1}(B)$ is an IFβCS in X. Therefore, $\beta cl(f^{-1}(B)) = f^{-1}(B) \subseteq f^{-1}(\beta cl(B))$. □

Definition 3.14: Let A be an IFS in an IFTS (X, τ). Then the β generalized interior and β generalized closure of A are defined as

$$\beta\text{gint}(A) = \cup \{G \,/\, G \text{ is an IF}\beta\text{GOS in } X \text{ and } G \subseteq A\},$$

$$\beta\text{gcl}(A) = \cap \{K \,/\, K \text{ is an IF}\beta\text{GCS in } X \text{ and } A \subseteq K\}.$$

Note that for any IFS A in (X, τ), we have $\beta\text{gcl}(A^c) = (\beta\text{gint}(A))^c$ and $\beta\text{gint}(A^c) = (\beta\text{gcl}(A))^c$.

Remark 3.15: If an IFS A in an IFTS (X, τ) is an IFβGCS in X, then $\beta\text{gcl}(A) = A$. But the converse may not be true in general, since intersection does not exist in IFβGCS [9].

Remark 3.16: If an IFS A in an IFTS (X, τ) is an IFβGOS in X, then $\beta\text{gint}(A) = A$. But the converse may not be true in general, since union does not exist in IFβGOS [10].

Theorem 3.17: Let f: $(X, \tau) \to (Y, \sigma)$ be a mapping. If f is an IFaβG continuous mapping, then $\beta\text{gcl}(f^{-1}(A)) \subseteq f^{-1}(\text{cl}(A))$ for every IFβOS A in Y.
Proof: Let A be an IFβOS in Y. Then $\text{cl}(A)$ is an IFRCS in Y [8]. By hypothesis $f^{-1}(\text{cl}(A))$ is an IFβGCS in X. Then $\beta\text{gcl}(f^{-1}(\text{cl}(A))) = f^{-1}(\text{cl}(A))$. Now $\beta\text{gcl}(f^{-1}(A)) \subseteq \beta\text{gcl}(f^{-1}(\text{cl}(A))) = f^{-1}(\text{cl}(A))$. That is $\beta\text{gcl}(f^{-1}(A)) \subseteq f^{-1}(\text{cl}(A))$. □

Theorem 3.18: Let f: $(X, \tau) \to (Y, \sigma)$ be a mapping. If f is an IFaβG continuous mapping, then $\beta\text{gcl}(f^{-1}(\text{cl}(A))) = f^{-1}(\text{cl}(\beta\text{int}(A)))$ for every IFβOS A in Y.
Proof: Let A be an IFβOS in Y. Then $\beta\text{int}(A) = A$ and $\text{cl}(A)$ is an IFRCS in Y [8]. By hypothesis $f^{-1}(\text{cl}(A))$ is an IFβGCS in X. Then $\beta\text{gcl}(f^{-1}(\text{cl}(A))) = f^{-1}(\text{cl}(A)) \subseteq f^{-1}(\text{cl}(\beta\text{int}(A)))$.

Theorem 3.19: Let f: $(X, \tau) \to (Y, \sigma)$ be a mapping where X is an IF$\beta_g T_{1/2}$ space. If f is an IFβG continuous mapping, then $\text{int}(\text{cl}(\text{int}(f^{-1}(B))) \subseteq f^{-1}(\beta\text{cl}(B))$ for every IFRCS B in Y.
Proof: Let $B \subseteq Y$ be an IFRCS. By hypothesis, $f^{-1}(B)$ is an IFβGCS in X. Since X is an IF$\beta_g T_{1/2}$ space, $f^{-1}(B)$ is an IFβCS in X. Therefore $\beta\text{cl}(f^{-1}(B)) = f^{-1}(B)$.
Now $\text{int}(\text{cl}(\text{int}(f^{-1}(B)))) \subseteq f^{-1}(B) \cup \text{int}(\text{cl}(\text{int}(f^{-1}(B)))) \subseteq \beta\text{cl}(f^{-1}(B)) = f^{-1}(B) = f^{-1}(\beta\text{cl}(B))$.
Hence $\text{int}(\text{cl}(\text{int}(f^{-1}(B)))) \subseteq f^{-1}(\beta\text{cl}(B))$. □

Theorem 3.20: Let f: $(X, \tau) \to (Y, \sigma)$ be a mapping where X is an IF$\beta_g T_{1/2}$ space. If f is an IFaβG continuous mapping, then $f^{-1}(\beta\text{int}(B)) \subseteq \text{cl}(\text{int}(\text{cl}(f^{-1}(B))))$ for every IFROS B in Y.
Proof: This theorem can be easily proved by taking complement in Theorem 3.19. □

Theorem 3.21: Let f: $(X, \tau) \to (Y, \sigma)$ be an IFaβG continuous mapping and g: $(Y, \sigma) \to (Z, \delta)$ is an IF continuous mapping then $g \circ f : (X, \tau) \to (Z, \delta)$ is an IFaβG continuous mapping.
Proof: Let V be an IFRCS in Z. Since every IFRCS is an IFCS in Z. Then $g^{-1}(V)$ is an IFCS in Y. Since f is an IFβG continuous mapping, $f^{-1}(g^{-1}(V))$ is an IFβGCS in X. Hence $g \circ f$ is an IFaβG continuous mapping. □

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