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Intuitionistic Fuzzy Generalized Beta Continuous Mappings

KEYWORDS: Intuitionistic fuzzy topology, intuitionistic fuzzy generalized beta T1/2 space, intuitionistic fuzzy generalized beta continuous mappings and intuitionistic fuzzy generalized beta irresolute mappings

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ABSTRACT *In this paper we introduce intuitionistic fuzzy generalized beta continuous mappings and intuitionistic fuzzy generalized beta irresolute mappings. We investigate some of their properties. Also we provide some characterization of intuitionistic fuzzy generalized beta continuous mappings and intuitionistic fuzzy generalized beta irresolute mappings.*

INTRODUCTION

Atanassov [1] introduced the notion of intuitionistic fuzzy sets. Using the notion of intuitionistic fuzzy sets, Coker [3] introduced the notion of intuitionistic fuzzy topological spaces. Intuitionistic fuzzy beta continuous mappings in intuitionistic fuzzy topological spaces are introduced by Coker[3]. In this paper we introduce intuitionistic fuzzy generalized beta continuous mappings and intuitionistic fuzzy generalized beta irresolute mappings and we provide some characterizations.

Preliminaries

Definition 2.1: [1] 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 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 $0 \le \mu_A(x) + \nu_A(x) \le 1$ for each $x \in X$. Denote by IFS (X), the set of all intuitionistic fuzzy sets in X.

Definition 2.2: [1] Let A and B be IFSs 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 $\mu_A(x) \le \mu_B(x)$ and $\nu_A(x) \ge \nu_B(x)$ 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 $A = \{\langle x, \mu_A(x), \nu_A(x)\rangle / x \in X\}$.

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

Definition 2.4: [3] An *intuitionistic fuzzy topology* (IFT for 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 an *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 IFTS (X, τ) is called an intuitionistic fuzzy closed set (IFCS in short) in X.

Definition 2.5:[3] Let (X, τ) be an IFTS and $A = \langle x, \mu_A, \nu_A\rangle$ be an IFS in X. Then the intuitionistic fuzzy interior and 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, τ), we have $cl(A^c) = (int(A))^c$ and $int(A^c) = (cl(A))^c$ [3].

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Definition 2.6:[3] An IFS $A = \langle x, \mu_A, \nu_A \rangle$ in an IFTS (X, τ) is said to be an

(i) *intuitionistic fuzzy semi closed set* (IFSCS in short) if $int(cl(A)) \subseteq A$
(ii) *intuitionistic fuzzy pre closed set* (IFPCS in short) if $cl(int(A)) \subseteq A$
(iii) *intuitionistic fuzzy α closed set* (IFαCS in short) if $cl(int(cl(A)) \subseteq A$
(iv) *intuitionistic fuzzy beta closed set* (IFβCS for short) $int(cl(int(A))) \subseteq A$

The respective complements of the above IFCSs are called their respective IFOSs.

Definition 2.7:[6] An IFS A in an IFTS (X, τ) is said to be an *intuitionistic fuzzy generalized beta closed set* (IFGβCS for short) if $\beta cl(A) \subseteq U$ whenever $A \subseteq U$ and U is an IFOS in (X, τ).

Every IFCS, IFGCS, IFSCS, IFPCS, IFαCS, IFβCS and IFSPCS is an IFGβCS but the separate converses may not be true in general [6].
The family of all IFGβCSs of an IFTS (X, τ) is denoted by IFGβC(X).

Definition 2.8:[3]
Let A be an IFS in an IFTS (X, τ). Then
$\beta int(A) = \cup \{G / G$ is an IFSPOS in X and $G \subseteq A\}$.
$\beta cl(A) = \cap \{K / K$ is an IFSPCS in X and $A \subseteq K\}$.

Note that for any IFS A in (X, τ), we have $\beta cl(A^c) = (\beta int(A))^c$ and $\beta int(A^c) = (\beta cl(A))^c$ [3].

Definition 2.9:[6] The complement A^c of an IFGβCS A in an IFTS (X, τ) is called an *intuitionistic fuzzy generalized beta open set* (IFGβOS for short) in X.

Definition 2.10:[4] Let f be a mapping from an IFTS (X, τ) into an IFTS (Y, σ). Then f is said to be an *intuitionistic fuzzy continuous* (IF continuous for short) mapping if $f^{-1}(B) \in IFO(X)$ for every $B \in \sigma$.

Definition 2.11: [5] Let f be a mapping from an IFTS (X, τ) into an IFTS (Y, σ). Then f is said to be an

(i) *intuitionistic fuzzy semi continuous* (IFS continuous) mapping if $f^{-1}(B) \in IFSO(X)$ for every $B \in \sigma$
(ii) *intuitionistic fuzzy α- continuous* (IFα- continuous) mapping if $f^{-1}(B) \in IF\alpha O(X)$ for every $B \in \sigma$
(iii) *intuitionistic fuzzy pre continuous* (IFP continuous) mapping if $f^{-1}(B) \in IFPO(X)$ for every $B \in \sigma$

Definition 2.12: [7] Let $f: (X, \tau) \to (Y, \sigma)$ be a mapping. Then f is said to be an *intuitionistic fuzzy generalized continuous* (IFG continuous) mapping if $f^{-1}(B) \in IFGC(X)$ for every IFCS B in Y.

Definition 2.13:[7] Let $c(\alpha, \beta)$ be an IFP of an IFTS (X, τ). An IFS A of X is called an intuitionistic fuzzy neighborhood (IFN for short) of $c(\alpha, \beta)$ if there exists an IFOS B in X such that $c(\alpha, \beta) \in B \subseteq A$.

Definition 2.14:[6] If every IFGβCS in (X, τ) is an IFβCS in (X, τ), then the space can be called as an intuitionistic fuzzy beta $T_{1/2}$ space (IFβ$T_{1/2}$ space for short).

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Theorem 2.15:[6] For any IFS A in an IFTS (X, τ) where X is an IFβ$T_{1/2}$ space, A ∈ IFGβO(X) if and only if for every IFP c(α , β) ∈ A, there exists an IFGβOS B in X such that c(α , β) ∈ B ⊆ A.

3. Intuitionistic fuzzy generalized beta continuous mappings

In this section we introduce intuitionistic fuzzy generalized beta continuous mapping and investigate some of its properties.

Definition 3.1: A mapping f: (X, τ) → (Y, σ) is called an intuitionistic fuzzy generalized beta continuous (IFGβ continuous) mapping if $f^{-1}(A)$ is an IFGβCS in Y for every IFCS A in X.

Example 3.2: Let X = {a, b}, Y = {u, v} and G_1 = ⟨x, (0.6_a, 0.7_b), (0.4_a, 0.3_b)⟩, G_2 = ⟨y, (0.5_u, 0.7_v), (0.5_u, 0.3_v)⟩. Then τ = {0~, G_1, 1~} and σ = {0~, G_2, 1~} 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 IFGβ continuous mapping.

Note that Every IF continuous mapping, IFβ continuous mapping, IFSP continuous mapping, IFS continuous mapping, IFP continuous mapping, IFG continuous mapping and IFα- continuous mapping is an IFGβ continuous mapping but not conversely. This can be easily seen from the following examples.

Example 3.3: In Example 3.2, f is an IFGβ continuous mapping but not an IF continuous mapping, not an IFG continuous mapping, and not an IFS continuous mapping.

Example 3.4: Let X = {a, b}, Y = {u, v} and G_1 = ⟨x, (0.6_a, 0.7_b), (0.2_a, 0.3_b)⟩, G_2 = ⟨x, (0.2_a, 0.1_b), (0.7_a, 0.8_b)⟩, G_3 = ⟨x, (0.5_a, 0.6_b), (0.5_a, 0.4_b)⟩, and let G_4 = ⟨y, (0.5_u, 0.3_v), (0.5_u, 0.7_v)⟩. Then τ = {0~, G_1, G_2, G_3, 1~} and σ = {0~, G_4, 1~} 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 IFGSP continuous mapping but not an IFP continuous mapping, not an IFα continuous mapping, and not an IFβ continuous mapping.

Example 3.5: Let X = {a, b}, Y = {u, v} and G_1 = ⟨x, (0.5_a, 0.4_b), (0.5_a, 0.6_b)⟩, G_2 = ⟨x, (0.2_a, 0.3_b), (0.8_a, 0.7_b)⟩, G_3 = ⟨x, (0.5_a, 0.5_b), (0.4_a, 0.5_b)⟩, G_4 = ⟨x, (0.6_a, 0.8_b), (0.4_a, 0.2_b)⟩, and let G_5 = ⟨y, (0.5_u, 0.8_v), (0.4_u, 0.2_v)⟩ . Then τ = {0~, G_1, G_2, G_3, G_4, 1~} and σ = {0~, G_5, 1~} 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 IFGSP continuous mapping but not an IFSP continuous mapping, since G_5^c is an IFCS in Y but $f^{-1}(G_5^c)$ is not an IFSPCS in X because we cannot find any IFPCS A such that int(A) ⊆ $f^{-1}(G_5^c)$ ⊆ A.

Theorem 3.6: A mapping f: (X, τ) → (Y, σ) is an IFGSP continuous mapping if and only if the inverse image of each IFOS in Y is an IFGβOS in X.

Proof: The proof is obvious since $f^{-1}(A^c) = (f^{-1}(A))^c$.

Theorem 3.7: Let f: (X, τ) → (Y, σ) be a mapping from an IFTS X into an IFTS Y. Then the following conditions are equivalent if X and Y are IFβ$T_{1/2}$ spaces.

(i) f is an IFGβ continuous mapping
(ii) $f^{-1}(B)$ is an IFGβOS in X for each IFOS B in Y
(iii) for every IFP c(α, β) in X and for every IFOS B in Y such that f(c(α, β)) ∈ B, there exists an IFGβOS A in X such that c(α, β) ∈ A and f(A) ⊆ B.

Proof: (i) ⇒ (ii) is obvious from the Theorem 3.6.

(ii) ⇒ (iii) Let B be any IFOS in Y and let c(α, β) ∈ X. Given f(c(α, β)) ∈ B. By hypothesis $f^{-1}(B)$ is an IFGSPOS in X. Take A = $f^{-1}(B)$. Now c(α, β) ∈ $f^{-1}(f(c(α, β)))$. Therefore $f^{-1}(f(c(α, β)))$ ∈ $f^{-1}(B)$ = A. This implies c(α, β) ∈ A and f(A) = $f(f^{-1}(B))$ ⊆ B.

(iii) ⇒ (i) Let A be an IFCS in Y. Then its complement, say B is an IFOS in Y. Let c(α, β) ∈ X and f(c(α, β)) ∈ B. Then there exists an IFGSPOS, say C = $f^{-1}(B)$ in X such that c(α, β) ∈ C and f(C) ⊆ B. Therefore $f^{-1}(B)$ is an IFGβOS in X, by Theorem 2.15. That is $f^{-1}(A^c)$ is an IFGβOS in X and hence $f^{-1}(A)$ is an IFGβCS in X. Thus f is an IFGβ continuous mapping.

Theorem 3.8: Let f: (X, τ) → (Y, σ) be a mapping from an IFTS X into an IFTS Y. Then the following conditions are equivalent if X and Y are IFβ$T_{1/2}$ spaces.

(i) f is an IFGβ continuous mapping
(ii) for each IFP c(α, β) in X and every IFN A of f(c(α, β)), there exists an IFGβOS B in X such that c(α, β) ∈ B ⊆ $f^{-1}(A)$.
(iii) for each IFP c(α, β) in X and for every IFN A of f(c(α, β)), there exists an IFGβOS B in X such that c(α, β) ∈ B and f(B) ⊆ A.

Proof: (i) ⇒ (ii) Let c(α, β) ∈ X and let A be an IFN of f(c(α, β)). Then there exists an IFOS C in Y such that f(c(α, β)) ∈ C ⊆ A. Since f is an IFGβ continuous mapping, $f^{-1}(C)$ = B (say), is an IFGβOS in X and c(α, β) ∈ B ⊆ $f^{-1}(A)$.

(ii) ⇒ (iii) Let c(α, β) ∈ X and let A be an IFN of f(c(α, β)). Then there exists an IFGβOS B in X such that c(α, β)) ∈ B⊆$f^{-1}(A)$, by hypothesis. Therefore c(α, β)) ∈ B and f(B) ⊆ $f(f^{-1}(A))$ ⊆ A.

(iii) ⇒ (i) Let B be an IFOS in Y and let c(α, β) ∈ $f^{-1}(B)$. Then f(c(α, β)) ∈ B. Therefore B is an IFN of f(c(α, β)). Since B is IFOS, by hypothesis there exists an IFGβOS A in X such that c(α, β) ∈ A ⊆ $f^{-1}(f(A))$ ⊆ $f^{-1}(B)$.Therefore $f^{-1}(B)$ is an IFGβOS in X, by Theorem 2.15. Hence f is an IFGβ continuous mapping.

Theorem 3.9: Let f: (X, τ) → (Y, σ) be a mapping from an IFTS X into an IFTS Y. Then the following conditions are equivalent if X is an IFβ$T_{1/2}$ space:

(i) f is an IFGβ continuous mapping
(ii) If B is an IFOS in Y then $f^{-1}(B)$ is an IFGβOS in X
(iii) $f^{-1}(int(B))$ ⊆ $cl(int(cl(f^{-1}(B))))$ for every IFS B in Y.

Proof: (i) ⇒ (ii) is obviously true by Theorem 3.6.

(ii) ⇒ (iii) Let B be any IFS in Y. Then int(B) is an IFOS in Y. Then $f^{-1}(int(B))$ is an IFGβOS in X. Since X is an IFβ$T_{1/2}$ space, $f^{-1}(int(B))$ is an IFβOS in X. Therefore f^{-}

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^{1}(int(B)) ⊆ cl(int(cl(f^{-1}(int(B))))) ⊆ cl(int(cl(f^{-1}(B)))).

(iii) ⇒ (i) Let B be an IFCS in Y. Then its complement, say A is an IFOS in Y, then int(A) = A. Now by hypothesis f^{-1}(int(A)) ⊆ cl(int(cl(f^{-1}(A)))). This implies f^{-1}(A) ⊆ cl(int(cl(f^{-1}(A)))). Hence f^{-1}(A) is an IFβOS in X. Since every IFβOS is an IFGβOS, f^{-1}(A) is an IFGβOS in X. Thus f^{-1}(B) is an IFGβCS in X, since f^{-1}(A) = f^{-1}(B^c). Hence f is an IFGβ continuous mapping.

Theorem 3.10: A mapping f: (X, τ) → (Y, σ) is an IFGβ continuous mapping if cl(int(cl(f^{-1}(A)))) ⊆ f^{-1}(cl(A)) for every IFS A in Y.

Proof: Let A be an IFOS in Y then A^c is an IFCS in Y. By hypothesis, cl(int(cl(f^{-1}(A^c)))) ⊆ f^{-1}(cl(A^c)) = f^{-1}(A^c), since A^c is an IFCS. Now (int(cl(int(f^{-1}(A)))))^c = cl(int(cl(f^{-1}(A^c)))) ⊆ f^{-1}(A^c) = (f^{-1}(A))^c. This implies f^{-1}(A) ⊆ int(cl(int(f^{-1}(A)))). Hence f^{-1}(A) is an IFαOS and hence it is an IFGβOS. Therefore f is an IFGβ continuous mapping, by Theorem 3.6.

Theorem 3.11: Let f: (X, τ) → (Y, σ) be a mapping from an IFTS X into an IFTS Y. Then the following conditions are equivalent if X is an IFβ$T_{1/2}$ space:

(i) f is an IFGβ continuous mapping

(ii f $^{-1}$(B) is an IFGβCS in X for every IFCS B in Y

(iii) int(cl(int(f^{-1}(A)))) ⊆ f^{-1}(cl(A)) for every IFS A in Y.

Proof : (i) ⇒ (ii) is obvious from the Definition 3.1.

(ii) ⇒ (iii) Let A be an IFS in Y. Then cl(A) is an IFCS in Y. By hypothesis, f^{-1}(cl(A)) is an IFGβCS in X. Since X is an IFβ$T_{1/2}$ space, f^{-1}(cl(A)) is an IFβCS. Therefore int(cl(int(f^{-1}(cl(A)))))⊆f^{-1}(cl(A)). Now int(cl(int(f^{-1}(A))))⊆ int(cl(int(f^{-1}(cl(A))))) ⊆f^{-1}(cl(A)).

(iii) ⇒ (i) Let A be an IFCS in Y. By hypothesis int(cl(int(f^{-1}(A)))) ⊆ f^{-1}(cl(A)) = f^{-1}(A). This implies f^{-1} (A) is an IFβCS in X and hence it is an IFGβCS. Thus f is an IFGβ continuous mapping.

4. Intuitionistic fuzzy generalized beta irresolute mappings

In this section we introduce intuitionistic fuzzy generalized beta irresolute mappings and study some of their properties.

Definition 4.1: A mapping f: (X, τ) → (Y, σ) is called *intuitionistic fuzzy generalized beta irresolute* (IFGβ irresolute) mapping if f^{-1}(V) is an IFGβCS in (X, τ) for every IFGβCS V of (Y, σ).

Theorem 4.2: Let f: (X, τ) → (Y, σ) be an IFGβ irresolute mapping, then f is an IFGβ continuous mapping but not conversely.

Proof: Let f be an IFGβ irresolute mapping. Let V be any IFCS in Y. Then V is an IFGβCS and by hypothesis f^{-1}(V) is an IFGβCS in X. Hence f is an IFGβ continuous mapping.

Example 4.3: Let X = {a, b}, Y = {u, v} and G_1 = ⟨x, (0.6_a, 0.7_b), (0.2_a, 0.1_b)⟩, G_2 = ⟨x, (0.3_a, 0.2_b), (0.2_a, 0.2_b)⟩, G_3 = ⟨y, (0.5_u, 0.6_v), (0.5_u, 0.4_v)⟩ . Then τ = {$0_\sim$, G_1, G_2, $1_\sim$} and σ = {$0_\sim$, G_3, $1_\sim$} are IFTs on X and

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Y respectively. Define a mapping f: (X, τ) → (Y, σ) by f (a) = u and f (b) = v. Then f is an IFGβ continuous mapping but not an IFGβ irresolute mapping, since the IFS $A = \langle y, (0.5_u, 0.3_v), (0.2_u, 0.1_v)\rangle$ is an IFGβCS in Y but $f^{-1}(A) = \langle x, (0.5_a, 0.3_b), (0.2_a, 0.1_b)\rangle \subseteq G_1$ is not an IFGβCS in X, since $\beta cl(f^{-1}(A)) = 1_{\sim} \not\subseteq G_1$.

Theorem 4.4: A mapping f: (X, τ) → (Y, σ) is an IFGβ irresolute mapping if and only if the inverse image of each IFGβOS in Y is an IFGβOS in X.

Proof: The proof is obvious from the Definition 4.1, since $f^{-1}(A^c) = (f^{-1}(A))^c$.

Theorem 4.5: Let f: (X, τ) → (Y, σ) be an IFGβ irresolute mapping, then f is an IFβ irresolute mapping if X is an $IF\beta T_{1/2}$ space.

Proof: Let V be an IFβCS in Y. Then V is an IFGβCS in Y. Therefore $f^{-1}(V)$ is an IFGβCS in X, by hypothesis. Since X is an $IF\beta T_{1/2}$ space, $f^{-1}(V)$ is an IFβCS in X. Hence f is an IFβ irresolute mapping.

Theorem 4.6: Let f: (X, τ) → (Y, σ) and g: (Y, σ) → (Z, γ) be IFGβ irresolute mappings, then g ∘ f : (X, τ) → (Z, γ) is an IFGβ irresolute mapping.

Proof: Let V be an IFGβCS in Z. Then $g^{-1}(V)$ is an IFGβCS in Y. Since f is an IFGβ irresolute, $f^{-1}(g^{-1}(V))$ is an IFGβCS in X, by hypothesis. Hence g ∘ f is an IFGβ irresolute mapping.

Theorem 4.7: Let f: (X, τ) → (Y, σ) be an IFGβ irresolute mapping and g: (Y, σ) → (Z, γ) is an IFGβ continuous mapping, then g ∘ f : (X, τ) → (Z, γ) is an IFGβ continuous mapping.

Proof: Let V be an IFCS in Z. Then $g^{-1}(V)$ is an IFGβCS in Y. Since f is an IFGβ irresolute mapping, $f^{-1}(g^{-1}(V))$ is an IFGβCS in X. Hence g ∘ f is an IFGβ continuous mapping.

Theorem 4.8: Let f: (X, τ) → (Y, σ) be a mapping from an IFTS X into an IFTS. Then the following conditions are equivalent if X and Y are $IF\beta T_{1/2}$ spaces:

(i) f is an IFGβ irresolute mapping
(ii) $f^{-1}(B)$ is an IFGβOS in X for each IFGβOS in Y
(iii) $f^{-1}(\beta int(B)) \subseteq \beta int(f^{-1}(B))$ for each IFS B of Y
(iv) $\beta cl(f^{-1}(B)) \subseteq f^{-1}(\beta cl(B))$ for each IFS B of Y

Proof: (i) ⇒ (ii) is obvious from the Theorem 4.4.

(ii) ⇒ (iii) Let B be any IFS in Y and $\beta int(B) \subseteq B$. Also $f^{-1}(\beta int(B)) \subseteq f^{-1}(B)$. Since βint(B) is an IFβOS in Y, it is an IFGβOS in Y. Therefore $f^{-1}(\beta int(B))$ is an IFGβOS in X, by hypothesis. Since X is an $IF\beta T_{1/2}$ space, $f^{-1}(\beta int(B))$ is an IFβOS in X. Hence $f^{-1}(\beta int(B)) = \beta int(f^{-1}(\beta int(B))) \subseteq \beta int(f^{-1}(B))$.

(iii) ⇒ (iv) is obvious by taking complement in (iii).

(iv)⇒ (i) Let B be an IFGβCS in Y. Since Y is an $IF\beta T_{1/2}$ space, B is an IFβCS in Y and βcl(B) = B. Hence $f^{-1}(B) = f^{-1}(\beta cl(B)) \supseteq \beta cl(f^{-1}(B))$. Therefore $\beta cl(f^{-1}(B)) = f^{-1}(B)$. This implies $f^{-1}(B)$ is an IFβCS and hence it is an IFGβCS in X. Thus f is an IFGβ irresolute mapping.

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