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RESEARCH ARTICLE

ON SOME INTUTIONISTIC SUPRA CLOSED SETS ON INTUTIONISTIC SUPRA TOPOLOGICAL SPACE

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ABSTRACT

The purpose of this paper is to introduce the sets called intutionistic supra α-closed set, intutionistic supra semi closed set and intutionistic supra Ω closed set on intutionistic supra topological space. Also we investigate about the continuity and irresoluteness of these sets in the intutionistic supra topological space.

Mathematics subject classification:54A99,54C99

Keywords: ISCS, ISαCS, ISSCS, ISΩCS, ISRCS, intutionistic supra continuity, intutionistic supra α continuity, intutionistic supra semi continuity, intutionistic supra Ω continuity, intutionistic supra α irresolute map, intutionistic supra semi irresolute map, intutionistic supra Ω irresolute map.

1. INTRODUCTION

The concept of intutionistic set and intutionistic topological spaces was introduced by Coker[1,3]. Zadeh[8] introduced the concept of fuzzy sets. Later Coker[2] intro-duced the intutionistic fuzzy topological spaces. Supra topology was introduced by A.S.Mashhour et al.[6]. Supra α open set in supra topological space was in-troduced by R.Devi et al.[4]. N.Levine[5] introduced semi-open sets and semi-continuity in topological space. T.Noiri and O.R.Sayed [7]introduced Ω closed set and Ωs-closed set in topological space.

In this paper we have introduced the set called intutionistic supra α-closed set, intutionistic supra semi closed set and intutionistic supra Ω-closed set on intu-tionistic supra topological space and we have discussed about the continuity and irresoluteness of these sets in the intutionistic supra topological space. Also we have discussed about the closed mapping of these intutionistics sets on intution-istic supra topological space.

2.Preliminaries

Definition 2.1[1] Let X be a non-empty set, an intutionistic set(IS in short) A is an object having the form A=< X, A_1, A_2 >, where A_1 and A_2 are subsets of X satisfying $A_1 \cap A_2 = \phi$. The set A_1 is called the set of members of A, while A_2 is called the set of non-members of A.

Definition 2.2[1] Let X be a non empty set, A=< X, A_1, A_2 > and B=<X, B_1, B_2 > be IS's on X and let {A_i : i ∈J} be an arbitrary family of IS's in X, where A_i =< X, $A^{(1)}_i$, $A^{(2)}_i$ >. then

(i)A⊆B iff $A_1 \subseteq B_1$ and $A_2 \supseteq B_2$.

(ii)A=B iff A⊆B and B⊆A.

(iii)$\bar{A}$=$< X, A_2, A_1 >$.

(iv)A∪B=$< X, A_1 \cup B_1, A_2 \cap B_2 >$.

(v)A∩B=$< X, A_1 \cap B_1, A_2 \cup B_2 >$.

(vi)A-B=A∩$\bar{B}$.

(vii)[ ]A=$< X, A_1, (A_1)^c >$.

viii) < > A =< X, $(A2)^c$, A_2>.

(ix)$\underset{\sim}{X}$=$< X, X, \phi >$.

(x)$\underset{\sim}{\phi}$ $=< X, \phi, X >$.

Definition 2.3[3]An Intutionistic topology on a nonempty set X is a family τ of IS's in X satisfying the following axioms:

(i)$\underset{\sim}{X}, \underset{\sim}{\phi} \in \tau$.

(ii)$A_1 \cap A_2 \in \tau$ for any $A_1, A_2 \in \tau$.

(iii)$\cup A_i \in \tau$ for any arbitrary family $\{A_i : i \in J\} \subseteq \tau$.

The pair(X,τ) is called intutionistic topological space(ITS in short) and IS in τ is known as an intutionistic open set(IOS in short) in X, the complement of IOS is called intutionistic closed set(ICS in short).

Definition 2.4[3] Let (X,τ) be an ITS and let A=< X, A_1, A_2 > be an IS in X, then the interior and closure of A are defined by:

cl(A)=$\bigcap\{K : K\ is\ an\ ICS\ in\ X\ and\ A \subseteq K\}$.

int(A)=$\bigcup\{K : K\ is\ an\ IOS\ in\ X\ and\ A \supseteq K\}$.

Definition 2.5[3]Let (X,τ) and (Y,σ) be two ITS's and let f:(X, τ) → (Y, σ) is said to be continuous iff the preimage of each IS in σ is an IS in τ .

Definition 2.6[6]

A subfamily μ of X is said to be supra topology on X if

i) X,ϕ ∈ μ

ii)If A_i ∈ μ, ∀i ∈ j then ∪A_i ∈ μ

(X, μ) is called supra topological space.

The element of μ are called supra open sets in (X, μ) and the complement of supra open set is called supra closed sets and it is denoted by μ^c.

Definition 2.7[6]

The supra closure of a set A is denoted by cl^μ(A), and is defined as

supra cl(A) = ∩{B : B is supra closed and A ⊆ B}.

The supra interier of a set A is denoted by int^μ(A), and is defined as supra int(A) = ∪{B : B is supra open and A ⊇ B}.

Definition 2.8[6] Let (X, τ) be a topological space and μ be a supra topology on X. We call μ a supra topology associated with τ , if τ ⊆ μ.

3. Intutionistic supra closed set

Definition 3.1 An Intutionistic supra topology on a nonempty set X is a family
τ of IS's in X satisfying the following axioms:

(i)$\underset{\sim}{X}, \underset{\sim}{\phi} \in \tau$.

(ii)$\cup A_i \in \tau$ for any arbitrary family $\{A_i : i \in J\} \subseteq \tau$.

The pair(X,τ) is called intutionistic supra topological space(ISTS in short) and IS in τ is known as an intutionistic supra open set(ISOS in short) in X, the com-plement of ISOS is called intutionistic supra closed set(ISCS in short).

Definition 3.2 Let (X,τ) be an ISTS and let A=< X, A_1, A_2 > be an IS in X,
then the supra closure and supra interior of A are defined by:

$cl^{\mu}(A) = \cap\{K : K$ is an ISCS in X and $A \subseteq K\}$.

$int^{\mu}(A) = \cup\{K : K$ is an ISOS in X and $A \supseteq K\}$.

Definition 3.3 Let (X,τ) be an intutionistic supra topological space. An intu-tionistic set A is called

(i)intutionistic supra α-closed set(ISαCS in short) if, $cl^{\mu}(int^{\mu}(cl^{\mu}(A))) \subseteq A$.

(ii)intutionistic supra semi closed set(ISSCS in short) if, $int^{\mu}(cl^{\mu}(A)) \subseteq A$.

(iii) intutionistic supra Ω-closed set(ISΩCS in short) if, $scl^{\mu}(A) \subseteq int^{\mu}(U)$, when-ever $A \subseteq U$, U is intutionistic supra open set.

(iv) intutionistic supra regular closed set(ISRCS in short) if, $A=cl^{\mu}int^{\mu}(A)$.

The complement of intutionistic supra α-closed set is intutionistic supra α-open set(ISαOS in short).

The complement of intutionistic supra semi-closed set is intutionistic supra semi-open set(ISSOS in short).

The complement of intutionistic supra Ω-closed set is intutionistic supra Ω-open set(ISΩOS in short).

The complement of intutionistic supra regular closed set is intutionistic supra reg-ular open set(ISROS in short).

Theorem 3.4 Every ISRCS is ISCS.

Proof Let (X,τ) be an intutionistic supra topological space. Let A be intutionis-tic supra regular closed set in (X,τ). Since A is ISRCS, we have $A=cl^{\mu}(int^{\mu}(A))$. Then $A=cl^{\mu}(int^{\mu}(A)) \subseteq cl^{\mu}(A)$. Hence A is intutionistic supra closed set.

Converse of the above theorem need not be true. It is shown by the following example.

Example 3.5 Let X=$\{a, b, c\}$. $\tau = \left\{\underset{\sim}{X}, \underset{\sim}{\phi}, A_1, A_2, A_3\right\}$, where $A_1 =< X, \{b\}, \{a, c\} >$, $A_2 =< X, \{a\}, \{b\} >$ and $A_3 =< X, \{a, b\}, \phi >$. ISCS's are $\left\{\underset{\sim}{X}, \underset{\sim}{\phi}, < X, \{a, c\}, \{b\} >, < X, \{b\}, \{a\}, < X, \phi, \{a, b\} >\right\}$. ISRCS's are $\left\{\underset{\sim}{X}, \underset{\sim}{\phi}, < X, \{a, c\}, \{b\} >, < X, \{b\}, \{a\} >\right\}$. Here $< X, \phi, \{a, b\} >$ is ISCS but it is not ISRCS.

Theorem 3.6 Every ISCS is ISαCS.

Proof Let (X,τ) be an intutionistic supra topological space. Let A be intu-tionistic supra closed set in (X,τ). Since A is ISCS, we have $cl^{\mu}(A) \subseteq A$. Then $int\mu(cl^{\mu}(A)) \subseteq cl^{\mu}(A)$. Implies $cl^{\mu}(int\mu(cl^{\mu}(A))) \subseteq cl^{\mu}(A)$. Therefore $cl^{\mu}(int^{\mu}(cl^{\mu}(A))) \subseteq A$. Hence A is ISαCS.

Converse of the above theorem need not be true. It is shown by the following example.

Example 3.7 Let X=$\{a,b,c\}$. $\tau = \left\{\underset{\sim}{X}, \underset{\sim}{\phi}, A_1, A_2\right\}$, where $A_1 =< X, \{a\}, \{c\} >$ and $A_2 =< X, \{a,b\}, \phi >$. ISCS's are $\left\{\underset{\sim}{X}, \underset{\sim}{\phi}, < X, \{c\}, \{a\} >, < X, \phi, \{a,b\} >\right\}$.
ISαCS's are $\left\{\underset{\sim}{X}, \underset{\sim}{\phi}, < X, \{c\}, \{a\} >, < X, \phi, \{a,b\} >, < X, \{c\}, \{a,b\} >, < X, \phi, \{a\} >, \right.$ $\left. < X, \phi, \{a,c\} >\right\}$. Here $< X, \{c\}, \{a,b\} >$ is ISαCS but not ISCS.

Theorem 3.8 Every ISCS is ISSCS

Proof Let (X,τ) be an intutionistic supra topological space. Let A be ISCS,we have $cl^{\mu}(A) \subseteq A$.Then $int^{\mu}(cl^{\mu}(A)) \subseteq cl^{\mu}(A) \subseteq A$.Hence A is ISSCS.

Converse of the above theorem need not be true. It is shown by the following example.

Example 3.9 Let X=$\{a,b,c\}$. $\tau = \left\{\underset{\sim}{X}, \underset{\sim}{\phi}, A_1, A_2, A_3\right\}$, where $A_1 =< X, \{b\}, \{a,c\} >$, $A_2 =< X, \{a\}, \{b\} >$ and $A_3 =< X, \{a,b\}, \phi >$. ISCS's are $\left\{\underset{\sim}{X}, \underset{\sim}{\phi}, < X, \{a,c\}, \{b\} >, < X, \{b\}, \{a\}, < X, \phi, \{a,b\} >\right\}$. ISSCS's are $\left\{\underset{\sim}{X}, \underset{\sim}{\phi}, < X, \{a,c\}, \{b\} >, < X, \{b\}, \{a\}, < X, \phi, \{a,b\} >, < X, \{a\}, \{b\} >, < X, \{b\}, \{a,c\} >\right\}$.
Here $< X, \{a\}, \{b\} >$ is ISSCS but it is not ISCS.

Theorem 3.10 Every ISCS is ISCS.

Proof: Let (X,τ) be an intutionistic supra topological space. Let A be ISCS in (X,τ). Let A ⊆U, U is ISOS. Since A is ISCS, $cl^{\mu}(A) \subseteq A \subseteq U$. Since every ISCS is ISSCS, then $scl^{\mu}(A) \subseteq cl^{\mu}(A) \subseteq A \subseteq U$. Since U is ISOS, we have $scl^{\mu}(A) \subseteq int^{\mu}(U)$. Hence A is ISΩCS.

Converse of the above theorem need not be true. It is shown by the following example.

Example 3.11 Let X=$\{a,b,c\}$. $\tau = \left\{\underset{\sim}{X}, \underset{\sim}{\phi}, A_1, A_2, A_3\right\}$, where $A_1 =< X, \{b\}, \{a,c\} >$, $A_2 =< X, \{a\}, \{b\} >$ and $A_3 =< X, \{a,b\}, \phi >$. ISCS's are $\left\{\underset{\sim}{X}, \underset{\sim}{\phi}, < X, \{a,c\}, \{b\} >, < X, \{b\}, \{a\}, < X, \phi, \{a,b\} >\right\}$. IS$\Omega$CS's are $\left\{\underset{\sim}{X}, \underset{\sim}{\phi}, < X, \{a,c\}, \{b\} >, < X, \{b\}, \{a\}, < X, \phi, \{a,b\} >, < X, \{a\}, \{b\} >, < X, \{b\}, \{a,c\} >, \right.$ $< X, \{c\}, \{a\} >, < X, \{a\}, \{b,c\} >, < X, \{b,c\}, \{a\} >, < X, \{a,c\}, \{b\} >, < X, \{a,b\}, \{c\} >,$ $< X, \{c\}, \{b\} >, < X, \{c\}, \phi >, < X, \{a,c\}, \phi >, < X, \phi, \{a\} >, < X, \phi, \{b\} >, < X, \phi, \{a,c\} >,$ $\left. < X, \phi, \{b,c\} >, < X, \phi, \phi >, < X, \{c\}, \{a,b\} >\right\}$. Here $< X, \{a\}, \{b\} >$ is ISΩCS but it is not ISCS.

Theorem 3.12 Every ISαCS is ISSCS.

Proof Let (X,τ) be an intutionistic supra topological space. Let A be ISαCS in (X,τ), then $cl^{\mu}(int^{\mu}(cl^{\mu}(A))) \subseteq A$.We have $int^{\mu}(cl^{\mu}(A)) \subseteq cl^{\mu}(int^{\mu}(cl^{\mu}(A))) \subseteq A$. Hence A is ISSCS.

Converse of the above theorem need not be true. It is shown by the following example

Example 3.13 Let X=$\{a,b,c\}$. $\tau = \left\{\underset{\sim}{X}, \underset{\sim}{\phi}, A_1, A_2, A_3\right\}$, where $A_1 =< X, \{b\}, \{a,c\} >$, $A_2 =< X, \{a\}, \{b\} >$ and $A_3 =< X, \{a,b\}, \phi >$. IS$\alpha$CS's are $\left\{\underset{\sim}{X}, \underset{\sim}{\phi}, < X, \{a,c\}, \{b\} >, < X, \{b\}, \{a\}, < X, \phi, \{a,b\} >\right\}$. ISSCS's are $\left\{\underset{\sim}{X}, \underset{\sim}{\phi}, < X, \{a,c\}, \{b\} >, < X, \{b\}, \{a\}, < X, \phi, \{a,b\} >, < X, \{a\}, \{b\} >, < X, \{b\}, \{a,c\} >\right\}$.
Here $< X, \{a\}, \{b\} >$ is ISSCS but it is not ISαCS.

Theorem 3.14 Every ISSCS is ISCS.

Proof Let (X,τ) be an intutionistic supra topological space. Let A be ISSCS in (X,τ). Let A ⊆U, U is ISOS. Since A is ISSCS, $scl^{\mu}(A) \subseteq U$.Hence A is ISSCS. Converse of the above theorem need not be true. It is shown by the following example.

Example 3.15 Let X=$\{a,b,c\}$. $\tau = \{\underset{\sim}{X}, \underset{\sim}{\phi}, A_1, A_2, A_3\}$, where $A_1 = < X, \{b\}, \{a,c\} >$, $A_2 = < X, \{a\}, \{b\} >$ and $A_3 = < X, \{a,b\}, \phi >$. ISCS's are $\{\underset{\sim}{X}, \underset{\sim}{\phi}, < X, \{a,c\}, \{b\} >, < X, \{b\}, \{a\}, < X, \phi, \{a,b\} >\}$. ISSCS's are $\{\underset{\sim}{X}, \underset{\sim}{\phi}, < X, \{a,c\}, \{b\} >, < X, \{b\}, \{a\}, < X, \phi, \{a,b\} >, < X, \{a\}, \{b\} >, < X, \{b\}, \{a,c\} >\}$. ISΩCS's are$\{\underset{\sim}{X}, \underset{\sim}{\phi}, < X, \{a,c\}, \{b\} >, < X, \{b\}, \{a\}, < X, \phi, \{a,b\} >, < X, \{a\}, \{b\} >,$ $< X, \{b\}, \{a,c\} >, < X, \{c\}, \{a\} >, < X, \{a\}, \{b,c\} >, < X, \{b,c\}, \{a\} >, < X, \{a,c\}, \{b\} >,$ $< X, \{a,b\}, \{c\} >, < X, \{c\}, \{b\} >, < X, \{c\}, \phi >, < X, \{a,c\}, \phi >, < X, \phi, \{a\} >, < X, \phi, \{b\} >,$ $< X, \phi, \{a,c\} >, < X, \phi, \{b,c\} >, < X, \phi, \phi >, < X, \{c\}, \{a,b\} >\}$. Here $< X, \phi, \{b\} >$ is ISΩCS but it is not ISSCS.

Theorem 3.16 Every ISαCS is ISΩCS.

Proof It is obvious from theorem 3.8 and theorem 3.9.

Converse of the above theorem need not be true. It is shown by the following example.

Example 3.17 Let X=$\{a,b,c\}$. $\tau = \{\underset{\sim}{X}, \underset{\sim}{\phi}, A_1, A_2, A_3\}$, where $A_1 = < X, \{b\}, \{a,c\} >$, $A_2 = < X, \{a\}, \{b\} >$ and $A_3 = < X, \{a,b\}, \phi >$. ISαCS's are $\{\underset{\sim}{X}, \underset{\sim}{\phi}, < X, \{a,c\}, \{b\} >, < X, \{b\}, \{a\}, < X, \phi, \{a,b\} >\}$. ISΩCS's are $\{\underset{\sim}{X}, \underset{\sim}{\phi}, < X, \{a,c\}, \{b\} >, < X, \{b\}, \{a\}, < X, \phi, \{a,b\} >, < X, \{a\}, \{b\} >, < X, \{b\}, \{a,c\} >,$ $< X, \{c\}, \{a\} >, < X, \{a\}, \{b,c\} >, < X, \{b,c\}, \{a\} >, < X, \{a,c\}, \{b\} >, < X, \{a,b\}, \{c\} >,$ $< X, \{c\}, \{b\} >, < X, \{c\}, \phi >, < X, \{a,c\}, \phi >, < X, \phi, \{a\} >, < X, \phi, \{b\} >,$ $< X, \phi, \{a,c\} >, < X, \phi, \{b,c\} >, < X, \phi, \phi >, < X, \{c\}, \{a,b\} >\}$. Here $< X, \{a\}, \{b\} >$ is ISΩCS but it is not ISαCS.

4. Intutionistic supra continuity

Definition 4.1 Let (X, τ) and (Y,σ)be two intutionistic supra topological space. A map f:(X,τ)→(Y,σ) is called

(i)intutionistic supra continuous map if $f^{-1}(V)$ is ISCS in X for every ISCS V in Y.

(ii)intutionistic supra α-continuous map if $f^{-1}(V)$ is ISαCS in X for every ISCS V in Y.

(iii)intutionistic supra semi-continuous map if $f^{-1}(V)$ is ISSCS in X for every ISCS V in Y.

(iv)intutionistic supra Ω-continuous map if $f^{-1}(V)$ is ISΩCS in X for every ISCS V in Y.

(v)intutionistic supra α-irresolute map if $f^{-1}(V)$ is ISαCS in X for every ISαCS V in Y.

(vi)intutionistic supra semi-irresolute map if $f^{-1}(V)$ is ISSCS in X for every ISSCS V in Y.

(vii)intutionistic supra Ω-irresolute map if $f^{-1}(V)$ is ISΩCS in X for every ISΩCS V in Y.

Theorem 4.2 Every intutionistic supra continuous map is intutionistic supra α-continuous map.

Proof Let f:(X,τ)→(Y,σ) be an intutionistic supra continuous map. Let V be ISCS in Y. Then $f^{-1}(V)$ is ISCS in X. Since every ISCS is ISαCS, then $f^{-1}(V)$ is ISαCS in X. Hence f is intutionistic supra α-continuous map.

The converse of the above theorem need not be true. It is shown by the following example.

Example 4.3 Let X=Y=$\{a,b,c\}$. $\tau = \{\underset{\sim}{X}, \underset{\sim}{\phi}, A_1, A_2\}$, where $A_1 = < X, \{a\}, \{c\} >$ and $A_2 = < X, \{a,b\}, \phi >$. $\sigma = \{\underset{\sim}{Y}, \underset{\sim}{\phi}, B_1, B_2, B_3\}$ where $B_1 = < Y, \{b\}, \{a,c\} >$, $B_2 = < Y, \{a\}, \{b\} >$, $B_3 = < Y, \{a,b\}, \phi >$. Let f:$(X,\tau) \rightarrow (Y,\sigma)$ defined by f(a)=a, f(b)=c and f(c)=b. Here V=$< Y, \phi, \{a,b\} >$ is ISCS in Y and f^{-1}(V)=$< X, \phi, \{a,c\} >$ is ISαCS but not ISCS in X. Hence f is not intutionistic supra continuous map.

Theorem 4.4 Every intutionistic supra continuous map is intutionistic supra semi-continuous map.

Proof Let f:(X,τ)→(Y,σ) be an intutionistic supra continuous map. Let V be ISCS in Y. Then $f^{-1}(V)$ is ISCS in X. Since every ISCS is ISSCS, then $f^{-1}(V)$ is ISSCS in X. Hence f is intutionistic supra semi-continuous map.

The converse of the above theorem need not be true. It is shown by the following example.

Example 4.5 Let X=Y=$\{a, b, c\}$. $\tau = \left\{\underset{\sim}{X}, \underset{\sim}{\phi}, A_1, A_2\right\}$, where $A_1 =< X, \{a\}, \{c\} >$ and $A_2 =< X, \{a, b\}, \phi >$. $\sigma = \left\{\underset{\sim}{Y}, \underset{\sim}{\phi}, B_1, B_2, B_3\right\}$ where $B_1 =< Y, \{b\}, \{a, c\} >$, $B_2 =< Y, \{a\}, \{b\} >$, $B_3 =< Y, \{a, b\}, \phi >$.Let f:$(X, \tau) \to (Y, \sigma)$ defined by f(a)=a, f(b)=c and f(c)=b. Here V=$< Y, \phi, \{a, b\} >$ is ISCS in Y and $f^{-1}(V)=< X, \phi, \{a, c\} >$ is ISSCS but not ISCS in X. Hence f is not intutionistic supra continuous map.

Theorem 4.6 Every intutionistic supra continuous map is intutionistic supra Ω-continuous map.

Proof Let f:(X,τ)→(Y,σ) be an intutionistic supra continuous map. Let V be ISCS in Y. Then $f^{-1}(V)$ is ISCS in X. Since every ISCS is ISΩCS, then $f^{-1}(V)$ is ISΩCS in X. Hence f is intutionistic supra Ω-continuous map.

The converse of the above theorem need not be true. It is shown by the following example.

Example 4.7 Let X=Y=$\{a, b, c\}$. $\tau = \left\{\underset{\sim}{X}, \underset{\sim}{\phi}, A_1, A_2\right\}$, where $A_1 =< X, \{a\}, \{c\} >$ and $A_2 =< X, \{a, b\}, \phi >$. $\sigma = \left\{\underset{\sim}{Y}, \underset{\sim}{\phi}, B_1, B_2, B_3\right\}$ where $B_1 =< Y, \{b\}, \{a, c\} >$, $B_2 =< Y, \{a\}, \{b\} >$, $B_3 =< Y, \{a, b\}, \phi >$. Let f:$(X, \tau) \to (Y, \sigma)$ defined by f(a)=a, f(b)=c and f(c)=b. Here V=$< Y, \phi, \{a, b\} >$ is ISCS in Y and $f^{-1}(V)=< X, \phi, \{a, c\} >$ is ISΩCS but not ISCS in X. Hence f is not intutionistic supra continuous map.

Theorem 4.8 Every intutionistic supra α-continuous map is intutionistic supra semi-continuous map.

Proof Let f:(X,τ)→(Y,σ) be an intutionistic supra α-continuous map. Let V be ISCS in Y. Then $f^{-1}(V)$ is ISαCS in X. Since every ISαCS is ISSCS, then $f^{-1}(V)$ is ISSCS in X. Hence f is intutionistic supra semi-continuous map.

The converse of the above theorem need not be true. It is shown by the following example.

Example 4.9 Let X=Y=$\{a, b, c\}$. $\tau = \left\{\underset{\sim}{X}, \underset{\sim}{\phi}, A_1, A_2, A_3\right\}$, where $A_1 =< X, \{c\}, \{a, b\} >$, $A_2 =< X, \{a\}, \{b, c\} >$ and $A_3 =< X, \{a, c\}, \{b\} >$. $\sigma = \left\{\underset{\sim}{Y}, \underset{\sim}{\phi}, B_1, B_2\right\}$, where $B_1 =< Y, \{a\}, \{c\} >$ and $B_2 =< Y, \{a, b\}, \phi >$. Let f:$(X, \tau) \to (Y, \sigma)$ defined by f(a)=a, f(b)=c and f(c)=b. Here V=$< Y, \phi, \{a, b\} >$ is ISCS in Y and $f^{-1}(V) =< X, \phi, \{a, c\} >$ is ISSCS but not ISαCS in X. Hence f is not intutionistic supra α continuous.

Theorem 4.10 Every intutionistic supra semi-continuous map is intutionistic supra Ω-continuous map.

Proof Let f:(X,τ)→(Y,σ) be an intutionistic supra semi-continuous map. Let V be ISCS in Y. Then $f^{-1}(V)$ is ISSCS in X. Since every ISSCS is ISΩCS, then $f^{-1}(V)$ is ISΩCS in X. Hence f is intutionistic supra Ω-continuous map.

The converse of the above theorem need not be true. It is shown by the following example.

Example 4.11 Let X=Y=$\{a,b,c\}$. $\tau = \{\underset{\sim}{X}, \underset{\sim}{\phi}, A_1, A_2, A_3\}$, where $A_1 = < X, \{c\}, \{a,b\} >$, $A_2 = < X, \{a\}, \{b,c\} >$ and $A_3 = < X, \{a,c\}, \{b\} >$. $\sigma = \{\underset{\sim}{Y}, \underset{\sim}{\phi}, B_1, B_2, B_3\}$, where $B_1 = < Y, \{a\}, \{c\} >$, $B_2 = < Y, \{c\}, \{a\} >$ and $B_3 = < Y, \{a,c\}, \phi >$. Let f:$(X,\tau) \to (Y,\sigma)$ defined by f(a)=a, f(b)=b and f(c)=c. Here V=$< Y, \{a,b\}, \{c\} >$ is ISCS in Y and $f^{-1}(V) = < X, \{a,b\}, \{c\} >$ is ISΩCS but not ISSCS in X. Hence f is not intutionistic supra semi continuous.

Theorem 4.12 Every intutionistic supra α-irresolute map is intutionistic supra α-continuous map.

Proof Let f:(X,τ)→(Y,σ) be an intutionistic supra α-irresolute map. Let V be ISCS in Y, then V is ISαCS in Y, since every ISCS is ISαCS. Then $f^{-1}(V)$ is ISαCS in X. Hence f is intutionistic supra α-continuous map.

The converse of the above theorem need not be true. It is shown by the following example.

Example 4.13 Let X=Y=$\{a,b,c\}$. $\tau = \{\underset{\sim}{X}, \underset{\sim}{\phi}, A_1, A_2, A_3\}$, where $A_1 = < X, \{b\}, \{a,c\} >$, $A_2 = < X, \{a\}, \{b\} >$ and $A_3 = < X, \{a,b\}, \phi >$. $\sigma = \{\underset{\sim}{Y}, \underset{\sim}{\phi}, B_1, B_2\}$, where $B_1 = < Y, \{a\}, \{b\} >$, $B_2 = < Y, \{a,b\}, \phi >$. Let f:$(X,\tau) \to (Y,\sigma)$ defined by f(a)=a, f(b)=b and f(c)=c. Here f is intutionistic supra α-continuous but not intutionistic supra α-irresolute map, since V=$< Y, \phi, \{a,b\} >$ is ISαCS in Y but $f^{-1}(V) = < X, \phi, \{a,c\} >$ is not ISαCS in X.

Theorem 4.14 Every intutionistic supra semi-irresolute map is intutionistic supra semi-continuous map.

Proof Let f:(X,τ)→(Y,σ) be an intutionistic supra semi-irresolute map. Let V be ISCS in Y. Since every ISCS is ISSCS, then V is ISSCS. Then $f^{-1}(V)$ is ISSCS in X. Hence f is intutionistic supra semi-continuous map.

The converse of the above theorem need not be true. It is shown by the following example.

Example 4.15 Let X=Y=$\{a,b,c\}$. $\tau = \{\underset{\sim}{X}, \underset{\sim}{\phi}, A_1, A_2, A_3\}$, where $A_1 = < X, \{b\}, \{a,c\} >$, $A_2 = < X, \{a\}, \{b\} >$ and $A_3 = < X, \{a,b\}, \phi >$. $\sigma = \{\underset{\sim}{Y}, \underset{\sim}{\phi}, B_1, B_2\}$, where $B_1 = < Y, \{a\}, \{b\} >$, $B_2 = < Y, \{a,b\}, \phi >$. Let f:$(X,\tau) \to (Y,\sigma)$ defined by f(a)=a, f(b)=b and f(c)=c. Here f is intutionistic supra semi-continuous but not intutionistic supra semi-irresolute map, since V=$< Y, \phi, \{a\} >$ is ISSCS in Y but $f^{-1}(V) = < X, \phi, \{a\} >$ is not ISSCS in X.

Theorem 4.16 Every intutionistic supra Ω-irresolute map is intutionistic supra Ω-continuous map.

Proof Let f:(X,τ)→(Y,σ) be an intutionistic supra Ω irresolute map. Let V be ISCS in Y. Since every ISCS is ISΩCS, then V is ISΩCS. Then $f^{-1}(V)$ is ISΩCS in X. Hence f is intutionistic supra Ω-continuous map.

The converse of the above theorem need not be true. It is shown by the following example.

Example 4.17 Let X=Y=$\{a,b,c\}$.$\tau = \{\underset{\sim}{X}, \underset{\sim}{\phi}, A_1, A_2\}$, where $A_1 = < X, \{a\}, \{b\} >$, $A_2 = < X, \{a,b\}, \phi >$. $\sigma = \{\underset{\sim}{Y}, \underset{\sim}{\phi}, B_1, B_2, B_3\}$, where $B_1 = < Y, \{b\}, \{a,c\} >$, $B_2 = < Y, \{a\}, \{b\} >$ and $B_3 = < Y, \{a,b\}, \phi >$. Let f:$(X,\tau) \to (Y,\sigma)$ defined by f(a)=a, f(b)=b and f(c)=c. Here f is intutionistic supra Ω-continuous but not intutionistic supra Ω-irresolute map, since V=$< Y, \phi, \{b\} >$ is ISΩCS in Y but $f^{-1}(V) = < X, \phi, \{b\} >$ is not ISΩCS in X.

5. Intutionistic supra closed map

Definition 5.1 Let (X, τ) and (Y,σ)be two intutionistic supra topological space. A map f:(X,τ)→(Y,σ) is called

(i)intutionistic supra closed map if the f(V)is ISCS in Y for every ISCS V in X. (ii)intutionistic supra α-closed map if the f(V)is ISαCS in Y for every ISCS V in X.

(iii)intutionistic supra semi-closed map if the f(V)is ISSCS in Y for every ISCS V in X.

(iv)intutionistic supra Ω-closed map if the f(V)is ISΩCS in Y for every ISCS V in X.

Theorem 5.2 Every intutionistic supra closed map is intutionistic supra α-closed map(resp.semi-closed map, Ω-closed map).

Proof Let f:(X,τ)→(Y,σ) be an intutionistic supra closed map. Let V be ISCS in X. Then f(V) is ISCS in Y. Since every ISCS is ISαCS(resp. ISSCS, ISΩCS), then f(V) is ISαCS(resp. ISSCS, ISΩCS) in Y. Hence f is intutionistic supra α-closed map(resp.semi-closed map, Ω-closed map).

The converse of the above theorem need not be true. It is shown by the following example.

Example 5.3 Let X=Y=$\{a, b, c\}$.$\tau = \left\{\underset{\sim}{X}, \underset{\sim}{\phi}, A_1, A_2\right\}$, where $A_1 =< X, \{a\}, \{c\} >$, $A_2 =< X, \{a, b\}, \phi >$. $\sigma = \left\{\underset{\sim}{Y}, \underset{\sim}{\phi}, B_1, B_2\right\}$, where $B_1 =< Y, \{a\}, \{b\} >$, and $B_2 =< Y, \{a, b\}, \phi >$. Let f:$(X, \tau) \to (Y, \sigma)$ defined by f(a)=a, f(b)=c and f(c)=b. Here f is intutionistic supra α-closed map(resp.semi-closed map, Ω-closed map) but not intutionistic supra closed map, since V=$< X, \phi, \{a, b\} >$ is ISCS in X but $f(V) =< Y, \phi, \{a, c\} >$ is not ISCS in Y.

Theorem 5.4 Every intutionistic supra α-closed map is intutionistic semi-closed map(resp.Ω-closed map).

Proof Let f:(X,τ)→(Y,σ) be an intutionistic supra α-closed map. Let V be ISCS in X. Then f(V) is ISαCS in Y. Since every ISαCS is ISSCS(resp. ISΩCS), then f(V) is ISSCS(resp. ISΩCS) in Y. Hence f is intutionistic supra semi-closed map(resp.Ω-closed map).

The converse of the above theorem need not be true. It is shown by the following example.

Example 5.5 Let X=Y=$\{a, b, c\}$.$\tau = \left\{\underset{\sim}{X}, \underset{\sim}{\phi}, A_1, A_2\right\}$, where $A_1 =< X, \{a\}, \{b\} >$, $A_2 =< X, \{a, b\}, \phi >$. $\sigma = \left\{\underset{\sim}{Y}, \underset{\sim}{\phi}, B_1, B_2, B_3\right\}$, where $B_1 =< Y, \{b\}, \{a, c\} >$, $B_2 =< Y, \{a\}, \{b\} >$ and $B_3 =< Y, \{a, b\}, \phi >$. Let f:$(X, \tau) \to (Y, \sigma)$ defined by f(a)=b, f(b)=a and f(c)=c. Here f is intutionistic supra semi-closed map(resp.Ω-closed map) but not intutionistic supra α-closed map, since V=$< X, \{b\}, \{a\} >$ is ISCS in X but $f(V) =< Y, \{a\}, \{b\} >$ is not ISαCS in Y.

Theorem 5.6 Every intutionistic supra semi-closed map is intutionistic Ω-closed map.

Proof Let f:(X,τ)→(Y,σ) be an intutionistic supra semi-closed map. Let V be ISCS in X. Then f(V) is ISSCS in Y. Since every ISSCS is ISΩCS, then f(V) is ISΩCS in Y. Hence f is intutionistic supra Ω-closed map.

The converse of the above theorem need not be true. It is shown by the following example.

Example 5.7 Let X=Y=$\{a,b,c\}$.$\tau = \left\{ \underset{\sim}{X}, \underset{\sim}{\phi}, A_1, A_2 \right\}$, where $A_1 =< X, \{a\}, \{c\} >$, $A_2 =< X, \{a,b\}, \phi >$. $\sigma = \left\{ \underset{\sim}{Y}, \underset{\sim}{\phi}, B_1, B_2, B_3 \right\}$, where $B_1 =< Y, \{b\}, \{a,c\} >$, $B_2 =< Y, \{a\}, \{b\} >$ and $B_3 =< Y, \{a,b\}, \phi >$. Let f:$(X,\tau) \to (Y,\sigma)$ defined by f(a)=b, f(b)=a and f(c)=c. Here f is intutionistic supra Ω-closed map but not intutionistic supra semi-closed map, since V=$< X, \{c\}, \{a\} >$ is ISCS in X but $f(V) =< Y, \{c\}, \{b\} >$ is not ISSCS in Y.

References

[1]. D.Coker, A note on intutionistic sets and intutionistic points, Tu.J.Math.20-3(1996),343-351.

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

[3]. Dogan Coker, An introduction to Intutionistic topological spaces, Busefal, 81(2000),51-56.

[4]. R.Devi, S.Sampathkumar and M.Caldas, On supra α-open sets ans Sα-continuous functions, general Mathematics, Vol 16 , Nr-2(2008),77-84.

[5]. N.Levine, semi open sets and semi continuity in topological spaces, Amer. Math., 12(1991), 5-13.

[6]. A.SMashhour, A.A.Allam, F.S.Mahmoud and F.H.Khedr, On Supra topologi-cal spaces, Indian J.Pure and Appl. Math., 14(4) (1983),502-510.

[7]. T.Noiri and O.R.Sayed, On Ω closed sets and Ωs closed sets in topological spaces, Acta Math,4(2005),307-318.

[8]. L.A.Zadeh, Fuzzy sets, Information and control, 8(1965)338-353.