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Strongly Contra Neutrosophic Gsα* -Continuous Function In Neutrosophic Topological Spaces

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Abstract: In this paper , the concept of Strongly Contra Neutrosophic gsα* - continuous function and Contra Neutrosophic gsα* - irresolute mapping are introduced in Neutrosophic Topological Spaces . We also discussed about the interrelations of these functions with the already existing neutrosophic functions. We also discussed about the properties and characterizations of these functions with examples .

Keywords: Neutrosophic $gs\alpha^* -$ closed sets ,Strongly Contra Neutrosophic $gs\alpha^*$ −continuous , Contra Neutrosophic $gs\alpha^* -$ irresolute mapping .

1 Introduction

The N_{eu} set theory was introduced by F.Smarandache[11] . It consists of three components namely truth, indeterminancy and false membership function . The idea of N_{eu} set comes from two concepts . One is intuitionistic fuzzy sets and it is introduced by K.Atanassov's[6] . The other idea is fuzzy sets and it is introduced by L.A.Zadeh's[15] . R.Dhavaseelan , S.Jafari , C.Ozel and M.A.Al-Shumrani[10] has introduced the concept of Strongly Contra $N_{eu}g -$ continuous and he also discussed about the idea of Contra $N_{eu}g -$ irresolute mapping . The real life application of N_{eu} topology is applied in Information Systems , Applied Mathematics etc .

In this paper, we introduce some new concepts in $N_{eu}TS$ such as Strongly Contra $N_{eu}gs\alpha^* -$ continuous and Contra $N_{eu}gs\alpha^* -$ irresolute mapping .

2 Preliminaries

Definition 2.1:[14] Let $\mathbb{P}$ be a non-empty fixed set . A N_{eu} set Ӈ on the universe $\mathbb{P}$ is defined as Ӈ= $\{\langle \wp, (t_{Ӈ}(\wp), i_{Ӈ}(\wp), f_{Ӈ}(\wp))\rangle : \wp \in \mathbb{P}\}$ where $t_{Ӈ}(\wp), i_{Ӈ}(\wp), f_{Ӈ}(\wp)$ represent the degree of membership function $t_{Ӈ}(\wp)$, the degree of indeterminacy $i_{Ӈ}(\wp)$ and the degree of non-membership function $f_{Ӈ}(\wp)$ respectively for each element $\wp \in \mathbb{P}$ to the set Ӈ . Also , $t_{Ӈ}$, $i_{Ӈ}$, $f_{Ӈ}$: $\mathbb{P} \to]^-0, 1^+[$ and $^-0 \leq t_{Ӈ}(\wp) + i_{Ӈ}(\wp) + f_{Ӈ}(\wp) \leq 3^+$. Set of all Neutrosophic set over $\mathbb{P}$ is denoted by $N_{eu}(\mathbb{P})$.

Definition 2.2:[14] Let $\mathbb{P}$ be a non-empty set. $Ⱥ = \left\{\langle \wp, \left(t_{Ⱥ}(\wp), i_{Ⱥ}(\wp), f_{Ⱥ}(\wp)\right) \rangle : \wp \in \mathbb{P}\right\}$ and $Ƀ = \{\langle \wp, (t_{Ƀ}(\wp), i_{Ƀ}(\wp), f_{Ƀ}(\wp)) \rangle : \wp \in \mathbb{P}\}$ are N_{eu} sets , then

(i) $Ⱥ \subseteq Ƀ$ if $t_{Ⱥ}(\wp) \leq t_{Ƀ}(\wp), i_{Ⱥ}(\wp) \leq i_{Ƀ}(\wp), f_{Ⱥ}(\wp) \geq f_{Ƀ}(\wp)$ for all $\wp \in \mathbb{P}$.

(ii) $Ⱥ \cap Ƀ = \left\{\langle \wp, \left(\min\left(t_{Ⱥ}(\wp), t_{Ƀ}(\wp)\right), \min\left(i_{Ⱥ}(\wp), i_{Ƀ}(\wp)\right), \max\left(f_{Ⱥ}(\wp), f_{Ƀ}(\wp)\right)\right) \rangle : \wp \in \mathbb{P}\right\}$.

(iii) $Ⱥ \cup Ƀ = \left\{\langle \wp, \left(\max\left(t_{Ⱥ}(\wp), t_{Ƀ}(\wp)\right), \max\left(i_{Ⱥ}(\wp), i_{Ƀ}(\wp)\right), \min\left(f_{Ⱥ}(\wp), f_{Ƀ}(\wp)\right)\right) \rangle : \wp \in \mathbb{P}\right\}$.

(iv) $Ⱥ^c = \left\{\langle \wp, \left(f_{Ⱥ}(\wp), 1 - i_{Ⱥ}(\wp), t_{Ⱥ}(\wp)\right) \rangle : \wp \in \mathbb{P}\right\}$.

(v) $0_{N_{eu}} = \{\langle \wp, (0,0,1)\rangle : \wp \in \mathbb{P}\}$ and $1_{N_{eu}} = \{\langle \wp, (1,1,0)\rangle : \wp \in \mathbb{P}\}$.

Definition 2.3:[14] A neutrosophic topology ($N_{eu}T$) on a non-empty set $\mathbb{P}$ is a family $\tau_{N_{eu}}$ of neutrosophic sets in $\mathbb{P}$

satisfying the following axioms ,

(i) $0_{N_{eu}}$, $1_{N_{eu}}$ $\in$ $\tau_{N_{eu}}$.

(ii) $\mathbb{A}_1 \cap \mathbb{A}_2 \in \tau_{N_{eu}}$ for any $\mathbb{A}_1$, $\mathbb{A}_2 \in \tau_{N_{eu}}$.

(iii) $\cup \mathbb{A}_i \in \tau_{N_{eu}}$ for every family $\{ \mathbb{A}_i \,/\, i \in \Omega \} \subseteq \tau_{N_{eu}}$.

In this case , the ordered pair $(\mathbb{P}, \tau_{N_{eu}})$ or simply $\mathbb{P}$ is called a neutrosophic topological space (N_{eu}TS) . The elements of $\tau_{N_{eu}}$ is neutrosophic open set $(N_{eu} - OS)$ and $\tau_{N_{eu}}{}^{c}$ is neutrosophic closed set $(N_{eu} - CS)$.

Definition 2.4:[1] A neutrosophic set $\mathbb{A}$ in a N_{eu}TS $(\mathbb{P}, \tau_{N_{eu}})$ is neutrosophic generalized semi alpha star closed set $(N_{eu}gs\alpha^* - CS)$ if $N_{eu}\alpha - int(N_{eu}\alpha - cl(\mathbb{A})) \subseteq N_{eu} - int(\mathcal{G})$, whenever $\mathbb{A} \subseteq \mathcal{G}$ and $\mathcal{G}$ is $N_{eu}\alpha^* - OS$.

Definition 2.5:[2] A $N_{eu}TS$ $(\mathbb{P}, \tau_{N_{eu}})$ is $N_{eu}gs\alpha^* - T_{1/2}$ space if every $N_{eu}gs\alpha^* - CS$ in $(\mathbb{P}, \tau_{N_{eu}})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}})$.

Definition 2.6: A N_{eu} function $f_N: (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{Q}, \sigma_{N_{eu}})$ is

(1) $N_{eu} -$ continuous[7] if ${f_N}^{-1}$ of $N_{eu} - CS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}})$.

(2) $N_{eu}gs\alpha^* -$ continuous[2] if ${f_N}^{-1}$ of $N_{eu} - CS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{P}, \tau_{N_{eu}})$.

(3) $N_{eu}gs\alpha^* -$ irresolute map[2] if ${f_N}^{-1}$ of $N_{eu}gs\alpha^* - CS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{P}, \tau_{N_{eu}})$.

(4) strongly $N_{eu}gs\alpha^*$ $-$ continuous[3] if ${f_N}^{-1}$ of $N_{eu}gs\alpha^* - CS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}})$.

(5) perfectly $N_{eu}gs\alpha^*$ $-$ continuous[3] if ${f_N}^{-1}$ of $N_{eu}gs\alpha^* - CS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$ is both $N_{eu} - OS$ and $N_{eu} - CS$ (ie , $N_{eu} -$ clopen set) in $(\mathbb{P}, \tau_{N_{eu}})$.

(6) almost $N_{eu}gs\alpha^*$ $-$ continuous[4] if ${f_N}^{-1}$ of $N_{eu}R - CS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{P}, \tau_{N_{eu}})$.

(7) almost contra $N_{eu}gs\alpha^* -$ continuous[5] if ${f_N}^{-1}$ of $N_{eu}R - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{P}, \tau_{N_{eu}})$.

(8) contra $N_{eu} -$ continuous[10] if ${f_N}^{-1}$ of $N_{eu} - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}})$.

(9) contra $N_{eu}gs\alpha^* -$ continuous[5] if ${f_N}^{-1}$ of $N_{eu} - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{P}, \tau_{N_{eu}})$.

Definition 2.7: A $N_{eu} -$ function $f_N: (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{Q}, \sigma_{N_{eu}})$ is

(1) strongly contra $N_{eu}g -$ continuous[10] if ${f_N}^{-1}$ of $N_{eu}g - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}})$.

(2) strongly contra $N_{eu}gR -$ continuous[7] if ${f_N}^{-1}$ of $N_{eu}gR - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}})$.

(3) strongly contra $N_{eu}g\alpha -$ continuous[9] if ${f_N}^{-1}$ of $N_{eu}g\alpha - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}})$.

(4) contra $N_{eu}gR -$ irresolute[7] if ${f_N}^{-1}$ of $N_{eu}gR - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$ is a $N_{eu}gR - CS$ in $(\mathbb{P}, \tau_{N_{eu}})$.

(5) contra $N_{eu}g\alpha -$ irresolute[9] if ${f_N}^{-1}$ of $N_{eu}g\alpha - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$ is a $N_{eu}g\alpha - CS$ in $(\mathbb{P}, \tau_{N_{eu}})$.

(6) contra $N_{eu}g -$ irresolute[10] if ${f_N}^{-1}$ of $N_{eu}g - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$ is a $N_{eu}g - CS$ in $(\mathbb{P}, \tau_{N_{eu}})$.

Definition 2.8:[8] A space $(\mathbb{P}, \tau_{N_{eu}})$ is $N_{eu} -$ locally indiscrete space if every $N_{eu} - OS$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}})$.

Definition 2.9:[5] A space $(\mathbb{P}, \tau_{N_{eu}})$ is $N_{eu}gs\alpha^* -$ locally indiscrete space if every $N_{eu}gs\alpha^* - OS$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}})$.

Definition 2.10:[13] Let $\tau_{N_{eu}} = \{0_{N_{eu}}, 1_{N_{eu}}\}$ is $N_{eu}TS$ over $\mathbb{P}$. Then $(\mathbb{P}, \tau_{N_{eu}})$ is $N_{eu} -$ discrete topological space .

3 Strongly Contra Neutrosophic $gs\alpha^*$ $-$ Continuous Function

Definition 3.1: A $N_{eu} -$ function $f_N: (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{Q}, \sigma_{N_{eu}})$ is strongly contra $N_{eu}gs\alpha^* -$ continuous if the inverse image of every $N_{eu}gs\alpha^* - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}})$. (ie) ${f_N}^{-1}(\mathbb{A})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}})$ for every $N_{eu}gs\alpha^* - OS$ $\mathbb{A}$ in $(\mathbb{Q}, \sigma_{N_{eu}})$.

Theorem 3.2: Every strongly contra $N_{eu}gs\alpha^* -$ continuous is contra $N_{eu}gs\alpha^* -$ continuous , but not conversely .

Proof: Let $f_N : (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{Q}, \sigma_{N_{eu}})$ be any $N_{eu} -$ function . Let $\mathbb{A}$ be any $N_{eu} - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Then $\mathbb{A}$ is a $N_{eu}gs\alpha^* - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Given f_N is strongly contra N_{eu} $gs\alpha^* -$ continuous , then ${f_N}^{-1}(\mathbb{A})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow {f_N}^{-1}(\mathbb{A})$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow f_N$ is contra $N_{eu}gs\alpha^* -$ continuous.

Example 3.3: Let $\mathbb{P} = \{p\}$ and $\mathbb{Q} = \{q\}$. $\tau_{N_{eu}} = \{0_{N_{eu}}, 1_{N_{eu}}, \mathbb{A}\}$ and $\sigma_{N_{eu}} = \{0_{N_{eu}}, 1_{N_{eu}}, \mathbb{B}\}$ are N_{eu}TS on $(\mathbb{P}, \tau_{N_{eu}})$ and $(\mathbb{Q}, \sigma_{N_{eu}})$. Also $\mathbb{A} = \{\langle p, (0.4, 0.6, 0.8)\rangle\}$ and $\mathbb{B} = \{\langle q, (0.2, 0.4, 0.6)\rangle\}$ are $N_{eu}(\mathbb{P})$ and $N_{eu}(\mathbb{Q})$. Define a map f_N : $(\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{Q}, \sigma_{N_{eu}})$ by $f_N(p) = q$. Let $\mathbb{B} = \{\langle q, (0.2, 0.4, 0.6)\rangle\}$ be a $N_{eu} - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Then ${f_N}^{-1}(\mathbb{B}) = \{\langle p, (0.2, 0.4, 0.6)\rangle\} \Rightarrow {f_N}^{-1}(\mathbb{B})$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow f_N$ is contra $N_{eu}gs\alpha^* -$ continuous . But f_N is not strongly contra $N_{eu}gs\alpha^* -$ continuous .

Theorem 3.4: Every strongly contra $N_{eu}gs\alpha^* -$ continuous is contra $N_{eu} -$ continuous , but not conversely .
Proof: Let $f_N : (\mathbb{P}, \tau_{N_{eu}}) \rightarrow (\mathbb{Q}, \sigma_{N_{eu}})$ be any $N_{eu} -$ function . Let $\mathbb{A}$ be any $N_{eu} - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Then $\mathbb{A}$ is a $N_{eu}\ gs\alpha^* - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Given f_N is strongly contra $N_{eu}\ gs\alpha^* -$ continuous , then ${f_N}^{-1}(\mathbb{A})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow f_N$ is contra $N_{eu} -$ continuous .
Example 3.5: Let $\mathbb{P}$ ={p} and $\mathbb{Q}$ ={q} . $\tau_{N_{eu}} = \{0_{N_{eu}}, 1_{N_{eu}}, \mathbb{A}\}$ and $\sigma_{N_{eu}} = \{0_{N_{eu}}, 1_{N_{eu}}, \mathbb{B}\}$ are N_{eu}TS on $(\mathbb{P}, \tau_{N_{eu}})$ and $(\mathbb{Q}, \sigma_{N_{eu}})$ respectively . Also $\mathbb{A}= \{\langle p, (0.6,0.6,0.2)\rangle\}$ and $\mathbb{B} = \{\langle q, (0.2, 0.4, 0.6)\rangle\}$ are $N_{eu}(\mathbb{P})$ and $N_{eu}(\mathbb{Q})$. Define a map $f_N: (\mathbb{P}, \tau_{N_{eu}}) \rightarrow (\mathbb{Q}, \sigma_{N_{eu}})$ by $f_N(p) = q$. Let $\mathbb{B} = \{\langle q, (0.2, 0.4, 0.6)\rangle\}$ be a $N_{eu} - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Then ${f_N}^{-1}(\mathbb{B}) = \{\langle p, (0.2, 0.4, 0.6)\rangle\} \Rightarrow {f_N}^{-1}(\mathbb{B})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow f_N$ is contra $N_{eu} -$ continuous . But f_N is not strongly contra $N_{eu}gs\alpha^* -$ continuous.
Theorem 3.6: Every strongly contra $N_{eu}gs\alpha^* -$ continuous is almost contra $N_{eu}gs\alpha^* -$ continuous , but not conversely .
Proof: Let $f_N : (\mathbb{P}, \tau_{N_{eu}}) \rightarrow (\mathbb{Q}, \sigma_{N_{eu}})$ be any $N_{eu} -$ function . Let $\mathbb{A}$ be any $N_{eu}R - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Then $\mathbb{A}$ is a $N_{eu} - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$ [12] $\Rightarrow \mathbb{A}$ is a $N_{eu}gs\alpha^* - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Given f_N is strongly contra $N_{eu}\ gs\alpha^* -$ continuous function , then ${f_N}^{-1}(\mathbb{A})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow {f_N}^{-1}(\mathbb{A})$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow f_N$ is almost contra $N_{eu}gs\alpha^* -$ continuous .
Example 3.7: Let $\mathbb{P}$ ={p} and $\mathbb{Q}$ ={q} . $\tau_{N_{eu}} = \{0_{N_{eu}}, 1_{N_{eu}}, \mathbb{A}\}$ and $\sigma_{N_{eu}} = \{0_{N_{eu}}, 1_{N_{eu}}, \mathbb{B}\}$ are N_{eu}TS on $(\mathbb{P}, \tau_{N_{eu}})$ and $(\mathbb{Q}, \sigma_{N_{eu}})$. Also $\mathbb{A}= \{\langle p, (0.4,0.5,0.7)\rangle\}$ and $\mathbb{B} = \{\langle q, (0.3, 0.4, 0.7)\rangle\}$ are $N_{eu}(\mathbb{P})$ and $N_{eu}(\mathbb{Q})$. Define a map $f_N: (\mathbb{P}, \tau_{N_{eu}}) \rightarrow (\mathbb{Q}, \sigma_{N_{eu}})$ by $f_N(p) = q$. Let $\mathbb{B} = \{\langle q, (0.3, 0.4, 0.7)\rangle\}$ be a $N_{eu}R - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Then ${f_N}^{-1}(\mathbb{B}) = \{\langle p, (0.3, 0.4, 0.7)\rangle\} \Rightarrow {f_N}^{-1}(\mathbb{B})$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow f_N$ is almost contra $N_{eu}gs\alpha^* -$ continuous . But f_N is not strongly contra $N_{eu}gs\alpha^* -$ continuous .
Theorem 3.8: Every perfectly $N_{eu}gs\alpha^* -$ continuous is strongly contra $N_{eu}gs\alpha^* -$ continuous , but not conversely .
Proof: Let $f_N : (\mathbb{P}, \tau_{N_{eu}}) \rightarrow (\mathbb{Q}, \sigma_{N_{eu}})$ be any $N_{eu} -$ function . Let $\mathbb{A}$ be any $N_{eu}gs\alpha^* - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Given f_N is perfectly $N_{eu}gs\alpha^* -$ continuous, then ${f_N}^{-1}(\mathbb{A})$ is both $N_{eu} - OS$ and $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow {f_N}^{-1}(\mathbb{A})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow f_N$ is strongly contra $N_{eu}gs\alpha^* -$ continuous .
Example 3.9: Let $\mathbb{P}$ ={p} and $\mathbb{Q}$ ={q}. $\tau_{N_{eu}} = \{0_{N_{eu}}, 1_{N_{eu}}, \mathbb{A}, \mathbb{C}\}$ and $\sigma_{N_{eu}} = \{0_{N_{eu}}, 1_{N_{eu}}, \mathbb{B}\}$ are N_{eu}TS on $(\mathbb{P}, \tau_{N_{eu}})$ and $(\mathbb{Q}, \sigma_{N_{eu}})$. Also $\mathbb{A}= \{\langle p, (0.4, 0.6, 0.2)\rangle\}$, $\mathbb{B} = \{\langle q, (0.4, 0.6, 0.2)\rangle\}$ and $\mathbb{C} = \{\langle p, ([0, 0.2], [0, 0.4], [0.4, 1])\rangle\}$ are $N_{eu}(\mathbb{P})$ and $N_{eu}(\mathbb{Q})$. Define a map $f_N : (\mathbb{P}, \tau_{N_{eu}}) \rightarrow (\mathbb{Q}, \sigma_{N_{eu}})$ by $f_N(p) = q$. Let $\mathbb{C} = \{\langle q, ([0, 0.2], [0, 0.4], [0.4, 1])\rangle\}$ be a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{Q}, \sigma_{N_{eu}}) \Rightarrow {f_N}^{-1}(\mathbb{C})$ is a $N_{eu} - OS$ in $(\mathbb{P}, \tau_{N_{eu}})$ $\Rightarrow f_N$ is strongly contra $N_{eu}gs\alpha^* -$ continuous . But f_N is not perfectly $N_{eu}gs\alpha^* -$ continuous .
Theorem 3.10: Let $f_N : (\mathbb{P}, \tau_{N_{eu}}) \rightarrow (\mathbb{Q}, \sigma_{N_{eu}})$ be strongly contra $N_{eu}gs\alpha^* -$ continuous and $(\mathbb{P}, \tau_{N_{eu}})$ is $N_{eu} -$ locally indiscrete space , then f_N is strongly $N_{eu}gs\alpha^* -$ continuous .
Proof: Let $\mathbb{A}$ be any $N_{eu}gs\alpha^* - CS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Given f_N is strongly contra $N_{eu}gs\alpha^* -$ continuous, then ${f_N}^{-1}(\mathbb{A})$ is a $N_{eu} - OS$ in $(\mathbb{P}, \tau_{N_{eu}})$. Given $(\mathbb{P}, \tau_{N_{eu}})$ is $N_{eu} -$ locally indiscrete space , then ${f_N}^{-1}(\mathbb{A})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow$ f_N is strongly $N_{eu}gs\alpha^* -$ continuous .
Theorem 3.11: Let $f_N : (\mathbb{P}, \tau_{N_{eu}}) \rightarrow (\mathbb{Q}, \sigma_{N_{eu}})$ be strongly contra $N_{eu}gs\alpha^* -$ continuous and $(\mathbb{P}, \tau_{N_{eu}})$ is $N_{eu} -$ locally indiscrete space , then f_N is $N_{eu}gs\alpha^* -$ irresolute .
Proof: Let $\mathbb{A}$ be any $N_{eu}gs\alpha^* - CS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Given f_N is strongly contra $N_{eu}gs\alpha^* -$ continuous , then ${f_N}^{-1}(\mathbb{A})$ is a $N_{eu} - OS$ in $(\mathbb{P}, \tau_{N_{eu}})$. Given $(\mathbb{P}, \tau_{N_{eu}})$ is $N_{eu} -$ locally indiscrete space , then ${f_N}^{-1}(\mathbb{A})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow$ ${f_N}^{-1}(\mathbb{A})$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow f_N$ is $N_{eu}gs\alpha^* -$ irresolute .
Theorem 3.12: Let $f_N : (\mathbb{P}, \tau_{N_{eu}}) \rightarrow (\mathbb{Q}, \sigma_{N_{eu}})$ be strongly contra $N_{eu}gs\alpha^* -$ continuous and $(\mathbb{P}, \tau_{N_{eu}})$ is $N_{eu} -$ locally indiscrete space , then f_N is $N_{eu}gs\alpha^* -$ continuous .
Proof: Let $\mathbb{A}$ be any $N_{eu} - CS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Then $\mathbb{A}$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Given f_N is strongly contra $N_{eu}gs\alpha^* -$ continuous , then ${f_N}^{-1}(\mathbb{A})$ is a $N_{eu} - OS$ in $(\mathbb{P}, \tau_{N_{eu}})$. Given $(\mathbb{P}, \tau_{N_{eu}})$ is neutrosophic locally indiscrete space , then ${f_N}^{-1}(\mathbb{A})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow {f_N}^{-1}(\mathbb{A})$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow f_N$ is $N_{eu}gs\alpha^* -$ continuous .
Theorem 3.13: Let $f_N : (\mathbb{P}, \tau_{N_{eu}}) \rightarrow (\mathbb{Q}, \sigma_{N_{eu}})$ be contra $N_{eu}gs\alpha^* -$ continuous . Then f_N is strongly contra

$N_{eu}gs\alpha^* -$ continuous , if $(\mathbb{P}, \tau_{N_{eu}})$ and $(\mathbb{Q}, \sigma_{N_{eu}})$ are $N_{eu}gs\alpha^* - T_{1/2}$ space .

Proof: Let $\mathbb{A}$ be any $N_{eu}gs\alpha^* - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Since $(\mathbb{Q}, \sigma_{N_{eu}})$ is a $N_{eu}gs\alpha^* - T_{1/2}$ space , then $\mathbb{A}$ is a $N_{eu} - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Given f_N is contra $N_{eu}gs\alpha^* -$ continuous , then ${f_N}^{-1}(\mathbb{A})$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{P}, \tau_{N_{eu}})$. Given $(\mathbb{P}, \tau_{N_{eu}})$ is a $N_{eu}gs\alpha^* - T_{1/2}$ space , then ${f_N}^{-1}(\mathbb{A})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow f_N$ is strongly contra $N_{eu}gs\alpha^* -$ continuous .

Theorem 3.14: Let $f_N : (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{Q}, \sigma_{N_{eu}})$ be contra $N_{eu} -$ continuous and $(\mathbb{Q}, \sigma_{N_{eu}})$ is a $N_{eu}gs\alpha^* - T_{1/2}$ space , then f is strongly contra $N_{eu}gs\alpha^* -$ continuous .

Proof: Let $\mathbb{A}$ be any $N_{eu}gs\alpha^* - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Given $(\mathbb{Q}, \sigma_{N_{eu}})$ is a $N_{eu}gs\alpha^* - T_{1/2}$ space , then $\mathbb{A}$ is a $N_{eu} - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Given f_N is contra $N_{eu} -$ continuous , then ${f_N}^{-1}(\mathbb{A})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow f_N$ is strongly contra $N_{eu}gs\alpha^* -$ continuous .

Theorem 3.15: Let $f_N : (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{Q}, \sigma_{N_{eu}})$ be strongly contra $N_{eu}gs\alpha^* -$ continuous and $(\mathbb{P}, \tau_{N_{eu}})$ is $N_{eu} -$ locally indiscrete space , then f_N is almost $N_{eu}gs\alpha^* -$ continuous.

Proof: Let $\mathbb{A}$ be any $N_{eu}R - CS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Then $\mathbb{A}$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Given f_N is strongly contra $N_{eu}gs\alpha^* -$ continuous , then ${f_N}^{-1}(\mathbb{A})$ is a $N_{eu} - OS$ in $(\mathbb{P}, \tau_{N_{eu}})$. Given $(\mathbb{P}, \tau_{N_{eu}})$ is a $N_{eu} -$ locally indiscrete space , then ${f_N}^{-1}(\mathbb{A})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow {f_N}^{-1}(\mathbb{A})$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow f_N$ is almost $N_{eu}gs\alpha^* -$ continuous .

Theorem 3.16: Let $f_N : (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{Q}, \sigma_{N_{eu}})$ be strongly contra $N_{eu}gs\alpha^* -$ continuous and $(\mathbb{P}, \tau_{N_{eu}})$ is $N_{eu} -$ discrete topological space , then f is perfectly $N_{eu}gs\alpha^* -$ continuous .

Proof: Let $\mathbb{A}$ be any $N_{eu}gs\alpha^* - CS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Given f_N is strongly contra $N_{eu}gs\alpha^* -$ continuous, then ${f_N}^{-1}(\mathbb{A})$ is a $N_{eu} - OS$ in $(\mathbb{P}, \tau_{N_{eu}})$. Given $(\mathbb{P}, \tau_{N_{eu}})$ is a neutrosophic discrete topological space, then ${f_N}^{-1}(\mathbb{A})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow {f_N}^{-1}(\mathbb{A})$ is both $N_{eu} - OS$ and $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow f_N$ is perfectly $N_{eu}gs\alpha^* -$ continuous .

Theorem 3.17: Let $f_N: (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{Q}, \sigma_{N_{eu}})$ be any $N_{eu} -$ function . Then the following are equivalent .

(1) f_N is strongly contra $N_{eu}gs\alpha^* -$ continuous.

(2) The inverse image of every $N_{eu}gs\alpha^* - CS$ $\mathbb{A}$ in $(\mathbb{Q}, \sigma_{N_{eu}})$ is a $N_{eu} - OS$ in $(\mathbb{P}, \tau_{N_{eu}})$.

Proof: (1) ⇒ (2) , Let $\mathbb{A}$ be any $N_{eu}gs\alpha^* - CS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Then $\mathbb{A}^c$ is a $N_{eu}gs\alpha^* - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Given f_N is strongly contra $N_{eu}gs\alpha^* -$ continuous, then ${f_N}^{-1}(\mathbb{A}^c) = \left({f_N}^{-1}(\mathbb{A})\right)^c$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow {f_N}^{-1}(\mathbb{A})$ is a $N_{eu} - OS$ in $(\mathbb{P}, \tau_{N_{eu}})$.

(2) ⇒ (1) , Let $\mathbb{A}$ be any $N_{eu}gs\alpha^* - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Then $\mathbb{A}^c$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. By hypothesis , ${f_N}^{-1}(\mathbb{A}^c) = \left({f_N}^{-1}(\mathbb{A})\right)^c$ is a $N_{eu} - OS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow {f_N}^{-1}(\mathbb{A})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow f_N$ is strongly contra $N_{eu}gs\alpha^* -$ continuous .

Theorem 3.18: Let $f_N: (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{Q}, \sigma_{N_{eu}})$ be strongly contra $N_{eu}gs\alpha^* -$ continuous and $g_N : (\mathbb{Q}, \sigma_{N_{eu}}) \to (\mathbb{R}, \gamma_{N_{eu}})$ be contra $N_{eu}gs\alpha^* -$ continuous , then $g_N o f_N : (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{R}, \gamma_{N_{eu}})$ is $N_{eu} -$ continuous .

Proof: Let $\mathbb{A}$ be any $N_{eu} - CS$ in $(\mathbb{R}, \gamma_{N_{eu}})$. Given g_N is contra $N_{eu}gs\alpha^* -$ continuous , then ${g_N}^{-1}(\mathbb{A})$ is a $N_{eu}gs\alpha^* - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Given f_N is strongly contra $N_{eu}gs\alpha^* -$ continuous , then ${f_N}^{-1}\left({g_N}^{-1}(\mathbb{A})\right) = (g_N o f_N)^{-1}(\mathbb{A})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow g_N o f_N$ is N_{eu} –continuous .

Theorem 3.19: Let $f_N: (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{Q}, \sigma_{N_{eu}})$ be strongly contra $N_{eu}gs\alpha^* -$ continuous and $g_N : (\mathbb{Q}, \sigma_{N_{eu}}) \to (\mathbb{R}, \gamma_{N_{eu}})$ be $N_{eu}gs\alpha^* -$ continuous , then $g_N o f_N : (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{R}, \gamma_{N_{eu}})$ is a contra $N_{eu} -$ continuous .

Proof: Let $\mathbb{A}$ be any $N_{eu} - OS$ in $(\mathbb{R}, \gamma_{N_{eu}})$. Given g_N is $N_{eu}gs\alpha^* -$ continuous , then ${g_N}^{-1}(\mathbb{A})$ is a $N_{eu}gs\alpha^* - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Given f_N is strongly contra $N_{eu}gs\alpha^* -$ continuous , then ${f_N}^{-1}\left({g_N}^{-1}(\mathbb{A})\right) = (g_N o f_N)^{-1}(\mathbb{A})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow g_N o f_N$ is contra $N_{eu} -$ continuous .

Theorem 3.20: Let $f_N: (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{Q}, \sigma_{N_{eu}})$ and $g_N : (\mathbb{Q}, \sigma_{N_{eu}}) \to (\mathbb{R}, \gamma_{N_{eu}})$ be strongly contra $N_{eu}gs\alpha^* -$ continuous . Then $g_N o f_N : (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{R}, \gamma_{N_{eu}})$ is strongly contra $N_{eu}gs\alpha^* -$ continuous , if $(\mathbb{P}, \tau_{N_{eu}})$ is $N_{eu} -$ locally indiscrete space .

Proof: Let $\mathbb{A}$ be any $N_{eu}gs\alpha^* - OS$ in $(\mathbb{R}, \gamma_{N_{eu}})$. Given g is strongly contra $N_{eu}gs\alpha^* -$ continuous, then ${g_N}^{-1}(\mathbb{A})$ is a $N_{eu}-CS$ in $(\mathbb{Q},\sigma_{N_{eu}}) \Rightarrow {g_N}^{-1}(₳)$ is a $N_{eu}gs\alpha^*-CS$ in $(\mathbb{Q},\sigma_{N_{eu}})$. Given f_N is strongly contra $N_{eu}gs\alpha^*-$ continuous , then ${f_N}^{-1}({g_N}^{-1}(₳)) = (g_N o\, f_N)^{-1}(₳)$ is a $N_{eu}-OS$ in $(\mathbb{P},\tau_{N_{eu}})$. Given $(\mathbb{P},\tau_{N_{eu}})$ is $N_{eu}-$ locally indiscrete space , then $(g_N o f_N)^{-1}(₳)$ is a $N_{eu}-CS$ in $(\mathbb{P},\tau_{N_{eu}}) \Rightarrow g_N o f_N$ is strongly contra $N_{eu}gs\alpha^*-$continuous.

4 Contra Neutrosophic $gs\alpha^*-$ Irresolute Mapping

Definition 4.1: A $N_{eu}-$ function $f_N\colon(\mathbb{P},\tau_{N_{eu}}) \to (\mathbb{Q},\sigma_{N_{eu}})$ is contra $N_{eu}gs\alpha^*-$irresolute if the inverse image of every $N_{eu}gs\alpha^*-OS$ in $(\mathbb{Q},\sigma_{N_{eu}})$ is a $N_{eu}gs\alpha^*-CS$ in $(\mathbb{P},\tau_{N_{eu}})$. (ie) ${f_N}^{-1}(₳)$ is a $N_{eu}gs\alpha^*-CS$ in $(\mathbb{P},\tau_{N_{eu}})$ for every $N_{eu}gs\alpha^*-OS$ ₳ in $(\mathbb{Q},\sigma_{N_{eu}})$.

Theorem 4.2: Every contra $N_{eu}gs\alpha^*-$irresolute is contra $N_{eu}gs\alpha^*-$continuous , but not conversely.

Proof: Let $f_N:(\mathbb{P},\tau_{N_{eu}}) \to (\mathbb{Q},\sigma_{N_{eu}})$ be any $N_{eu}-$ function . Let ₳ be any $N_{eu}-OS$ in $(\mathbb{Q},\sigma_{N_{eu}})$. Then ₳ is $N_{eu}gs\alpha^*-OS$ in $(\mathbb{Q},\sigma_{N_{eu}})$. Given f_N is contra $N_{eu}\,gs\alpha^*-$irresolute , then ${f_N}^{-1}(₳)$ is a $N_{eu}gs\alpha^*-CS$ in $(\mathbb{P},\tau_{N_{eu}}) \Rightarrow f_N$ is contra $N_{eu}gs\alpha^*-$continuous .

Example 4.3: Let $\mathbb{P}=\{\mathscr{p}\}$ and $\mathbb{Q}=\{\mathscr{q}\}$. $\tau_{N_{eu}}=\{0_{N_{eu}},1_{N_{eu}},₳\}$ and $\sigma_{N_{eu}}=\{0_{N_{eu}},1_{N_{eu}},Ƀ\}$ are N_{eu}TS on $(\mathbb{P},\tau_{N_{eu}})$ and $(\mathbb{Q},\sigma_{N_{eu}})$. Also $₳=\{\langle\mathscr{p},(0.7,0.6,0.5)\rangle\}$ and $Ƀ=\{\langle\mathscr{q},(0.3,0.2,0.8)\rangle\}$ are $N_{eu}(\mathbb{P})$ and $N_{eu}(\mathbb{Q})$. Define a map $f_N\colon(\mathbb{P},\tau_{N_{eu}}) \to (\mathbb{Q},\sigma_{N_{eu}})$ by $f_N(\mathscr{p})=\mathscr{q}$. Let $Ƀ=\{\langle\mathscr{q},(0.3,0.2,0.8)\rangle\}$ be a $N_{eu}-OS$ in $(\mathbb{Q},\sigma_{N_{eu}})$. Then ${f_N}^{-1}(Ƀ)=\{\langle\mathscr{p},(0.3,0.2,0.8)\rangle\} \Rightarrow {f_N}^{-1}(Ƀ)$ is a $N_{eu}gs\alpha^*-CS$ in $(\mathbb{P},\tau_{N_{eu}}) \Rightarrow f_N$ is contra $N_{eu}gs\alpha^*-$continuous . But f_N is not contra $N_{eu}gs\alpha^*-$irresolute .

Theorem 4.4: Every strongly contra $N_{eu}gs\alpha^*-$continuous is contra $N_{eu}gs\alpha^*-$irresolute , but not conversely.

Proof: Let $f_N:(\mathbb{P},\tau_{N_{eu}}) \to (\mathbb{Q},\sigma_{N_{eu}})$ be any $N_{eu}-$ function . Let ₳ be any $N_{eu}gs\alpha^*-OS$ in $(\mathbb{Q},\sigma_{N_{eu}})$. Given f_N is strongly contra $N_{eu}\,gs\alpha^*-$continuous , then ${f_N}^{-1}(₳)$ is a $N_{eu}-CS$ in $(\mathbb{P},\tau_{N_{eu}}) \Rightarrow {f_N}^{-1}(₳)$ is a $N_{eu}gs\alpha^*-CS$ in $(\mathbb{P},\tau_{N_{eu}}) \Rightarrow f_N$ is contra $N_{eu}gs\alpha^*-$irresolute .

Example 4.5: Let $\mathbb{P}=\{\mathscr{p}\}$ and $\mathbb{Q}=\{\mathscr{q}\}$. $\tau_{N_{eu}}=\{0_{N_{eu}},1_{N_{eu}},₳\}$ and $\sigma_{N_{eu}}=\{0_{N_{eu}},1_{N_{eu}},Ƀ\}$ are N_{eu}TS on $(\mathbb{P},\tau_{N_{eu}})$ and $(\mathbb{Q},\sigma_{N_{eu}})$. Also $₳=\{\langle\mathscr{p},(0.4,0.5,0.7)\rangle\}$ and $Ƀ=\{\langle\mathscr{q},(0.2,0.3,0.7)\rangle\}$ are $N_{eu}(\mathbb{P})$ and $N_{eu}(\mathbb{Q})$. Define a map $f_N\colon(\mathbb{P},\tau_{N_{eu}}) \to (\mathbb{Q},\sigma_{N_{eu}})$ by $f_N(\mathscr{p})=\mathscr{q}$. Let $Ȼ=\{\langle\mathscr{q},(0.3,0.4,0.6)\rangle\}$ be a $N_{eu}gs\alpha^*-OS$ in $(\mathbb{Q},\sigma_{N_{eu}})$. Then ${f_N}^{-1}(Ȼ)=\{\langle\mathscr{p},(0.3,0.4,0.6)\rangle\} \Rightarrow {f_N}^{-1}(Ȼ)$ is a $N_{eu}gs\alpha^*-CS$ in $(\mathbb{P},\tau_{N_{eu}}) \Rightarrow f_N$ is contra $N_{eu}gs\alpha^*-$irresolute . But f_N is not strongly contra $N_{eu}gs\alpha^*-$continuous .

Theorem 4.6: Every perfectly $N_{eu}gs\alpha^*-$continuous is contra $N_{eu}gs\alpha^*-$irresolute , but not conversely .

Proof: Let $f_N:(\mathbb{P},\tau_{N_{eu}}) \to (\mathbb{Q},\sigma_{N_{eu}})$ be any $N_{eu}-$ function . Let ₳ be any $N_{eu}gs\alpha^*-OS$ in $(\mathbb{Q},\sigma_{N_{eu}})$. Given f_N is perfectly $N_{eu}\,gs\alpha^*-$continuous , then ${f_N}^{-1}(₳)$ is $N_{eu}-OS$ and $N_{eu}-CS$ in $(\mathbb{P},\tau_{N_{eu}}) \Rightarrow {f_N}^{-1}(₳)$ is a $N_{eu}gs\alpha^*-CS$ in $(\mathbb{P},\tau_{N_{eu}}) \Rightarrow f_N$ is contra $N_{eu}gs\alpha^*-$irresolute .

Example 4.7: Let $\mathbb{P}=\{\mathscr{p}\}$ and $\mathbb{Q}=\{\mathscr{q}\}$. $\tau_{N_{eu}}=\{0_{N_{eu}},1_{N_{eu}},₳\}$ and $\sigma_{N_{eu}}=\{0_{N_{eu}},1_{N_{eu}},Ƀ\}$ are N_{eu}TS on $(\mathbb{P},\tau_{N_{eu}})$ and $(\mathbb{Q},\sigma_{N_{eu}})$. Also $₳=\{\langle\mathscr{p},(0.4,0.5,0.8)\rangle\}$ and $Ƀ=\{\langle\mathscr{q},(0.2,0.4,0.6)\rangle\}$ are $N_{eu}(\mathbb{P})$ and $N_{eu}(\mathbb{Q})$. Define a map $f_N\colon(\mathbb{P},\tau_{N_{eu}}) \to (\mathbb{Q},\sigma_{N_{eu}})$ by $f_N(\mathscr{p})=\mathscr{q}$. Let $Ȼ=\{\langle\mathscr{q},(0.5,0.2,0.8)\rangle\}$ be a $N_{eu}gs\alpha^*-OS$ in $(\mathbb{Q},\sigma_{N_{eu}})$. Then ${f_N}^{-1}(Ȼ)=\{\langle\mathscr{p},(0.5,0.2,0.8)\rangle\} \Rightarrow {f_N}^{-1}(Ȼ)$ is a $N_{eu}gs\alpha^*-CS$ in $(\mathbb{P},\tau_{N_{eu}}) \Rightarrow f_N$ is contra $N_{eu}gs\alpha^*-$irresolute . But f_N is not perfectly $N_{eu}gs\alpha^*-$continuous .

Theorem 4.8: Every contra $N_{eu}gs\alpha^*-$irresolute is almost contra $N_{eu}gs\alpha^*-$continuous , but not conversely .

Proof: Let $f_N:(\mathbb{P},\tau_{N_{eu}}) \to (\mathbb{Q},\sigma_{N_{eu}})$ be any $N_{eu}-$ function . Let ₳ be any $N_{eu}R-OS$ in $(\mathbb{Q},\sigma_{N_{eu}})$. Then ₳ is a $N_{eu}-OS$ in $(\mathbb{Q},\sigma_{N_{eu}}) \Rightarrow$ ₳ is a $N_{eu}gs\alpha^*-OS$ in $(\mathbb{Q},\sigma_{N_{eu}})$. Given f_N is contra $N_{eu}\,gs\alpha^*-$irresolute , then ${f_N}^{-1}(₳)$ is $N_{eu}gs\alpha^*-CS$ in $(\mathbb{P},\tau_{N_{eu}}) \Rightarrow f_N$ is almost contra $N_{eu}gs\alpha^*-$continuous .

Example 4.9: Let $\mathbb{P}=\{\mathscr{p}\}$ and $\mathbb{Q}=\{\mathscr{q}\}$. $\tau_{N_{eu}}=\{0_{N_{eu}},1_{N_{eu}},₳\}$ and $\sigma_{N_{eu}}=\{0_{N_{eu}},1_{N_{eu}},Ƀ\}$ are N_{eu}TS on $(\mathbb{P},\tau_{N_{eu}})$ and $(\mathbb{Q},\sigma_{N_{eu}})$. Also $₳=\{\langle\mathscr{p},(0.6,0.8,0.4)\rangle\}$ and $Ƀ=\{\langle\mathscr{q},(0.7,0.6,0.5)\rangle\}$ are $N_{eu}(\mathbb{P})$ and $N_{eu}(\mathbb{Q})$. Define a map $f_N\colon(\mathbb{P},\tau_{N_{eu}}) \to (\mathbb{Q},\sigma_{N_{eu}})$ by $f_N(\mathscr{p})=\mathscr{q}$. Let $Ȼ=\{\langle\mathscr{q},(0,0,1)\rangle\}$ be a $N_{eu}R-OS$ in $(\mathbb{Q},\sigma_{N_{eu}})$. Then ${f_N}^{-1}(Ȼ)=\{\langle\mathscr{p},(0,0,1)\rangle\} \Rightarrow {f_N}^{-1}(Ȼ)$ is a $N_{eu}gs\alpha^*-CS$ in $(\mathbb{P},\tau_{N_{eu}}) \Rightarrow f_N$ is almost contra $N_{eu}gs\alpha^*-$continuous . But f_N is not contra $N_{eu}gs\alpha^*-$irresolute .

Theorem 4.10: Let $f_N:(\mathbb{P},\tau_{N_{eu}}) \to (\mathbb{Q},\sigma_{N_{eu}})$ be contra $N_{eu}gs\alpha^*-$continuous and $(\mathbb{Q},\sigma_{N_{eu}})$ is $N_{eu}gs\alpha^*-T_{1/2}$

space , then f_N is contra $N_{eu}gs\alpha^* -$ irresolute .

Proof: Let $\mathbb{A}$ be any $N_{eu}gs\alpha^* - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Given $(\mathbb{Q}, \sigma_{N_{eu}})$ is a $N_{eu}gs\alpha^* - T_{1/2}$ space , then $\mathbb{A}$ is a $N_{eu} - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Given f_N is contra $N_{eu}gs\alpha^* -$ continuous , then ${f_N}^{-1}(\mathbb{A})$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow f_N$ is contra $N_{eu}gs\alpha^* -$ irresolute.

Theorem 4.11: Let $f_N : (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{Q}, \sigma_{N_{eu}})$ be contra $N_{eu}gs\alpha^* -$ irresolute and $(\mathbb{P}, \tau_{N_{eu}})$ is $N_{eu}gs\alpha^* - T_{1/2}$ space , then f_N is strongly contra $N_{eu}gs\alpha^*$ –continuous .

Proof: Let $\mathbb{A}$ be any $N_{eu}gs\alpha^* - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Given f_N is contra $N_{eu}gs\alpha^* -$ irresolute , then ${f_N}^{-1}(\mathbb{A})$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{P}, \tau_{N_{eu}})$. Given $(\mathbb{P}, \tau_{N_{eu}})$ is $N_{eu}gs\alpha^* - T_{1/2}$ space , then ${f_N}^{-1}(\mathbb{A})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow f_N$ is strongly contra $N_{eu}gs\alpha^* -$ continuous .

Theorem 4.12: Let $f_N : (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{Q}, \sigma_{N_{eu}})$ be strongly $N_{eu}gs\alpha^* -$ continuous and $(\mathbb{P}, \tau_{N_{eu}})$ is neutrosophic locally indiscrete space , then f_N is contra $N_{eu}gs\alpha^* -$ irresolute .

Proof: Let $\mathbb{A}$ be any $N_{eu}gs\alpha^* - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Given f_N is strongly $N_{eu}gs\alpha^* -$ continuous , then ${f_N}^{-1}(\mathbb{A})$ is a $N_{eu} - OS$ in $(\mathbb{P}, \tau_{N_{eu}})$. Given $(\mathbb{P}, \tau_{N_{eu}})$ is $N_{eu} -$ locally indiscrete space , then ${f_N}^{-1}(\mathbb{A})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow$ ${f_N}^{-1}(\mathbb{A})$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow f_N$ is contra $N_{eu}gs\alpha^* -$ irresolute .

Theorem 4.13: Let $f_N : (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{Q}, \sigma_{N_{eu}})$ be contra $N_{eu}gs\alpha^* -$ irresolute . Then f_N is perfectly $N_{eu}gs\alpha^* -$ continuous , if $(\mathbb{P}, \tau_{N_{eu}})$ is both $N_{eu}gs\alpha^* - T_{1/2}$ space and $N_{eu} -$ discrete topological space.

Proof: Let $\mathbb{A}$ be any $N_{eu}gs\alpha^* - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Given f_N is contra $N_{eu}gs\alpha^* -$ irresolute , then ${f_N}^{-1}(\mathbb{A})$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{P}, \tau_{N_{eu}})$. Given $(\mathbb{P}, \tau_{N_{eu}})$ is $N_{eu}gs\alpha^* - T_{1/2}$ space , then ${f_N}^{-1}(\mathbb{A})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}})$. Since $(\mathbb{P}, \tau_{N_{eu}})$ is $N_{eu} -$ discrete topological space , then ${f_N}^{-1}(\mathbb{A})$ is a $N_{eu} - OS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow {f_N}^{-1}(\mathbb{A})$ is both $N_{eu} - OS$ and $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow f_N$ is perfectly $N_{eu}gs\alpha^* -$ continuous .

Theorem 4.14: Let $f_N: (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{Q}, \sigma_{N_{eu}})$ be any $N_{eu} -$ function . Then the following are equivalent .

(1) f_N is contra $N_{eu}gs\alpha^* -$ irresolute .

(2) The inverse image of every $N_{eu}gs\alpha^* - CS$ $\mathbb{A}$ in $(\mathbb{Q}, \sigma_{N_{eu}})$ is a $N_{eu}gs\alpha^* - OS$ in $(\mathbb{P}, \tau_{N_{eu}})$.

Proof: (1) ⇒ (2) , Let $\mathbb{A}$ be any $N_{eu}gs\alpha^* - CS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Then $\mathbb{A}^c$ is a $N_{eu}gs\alpha^* - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Given f_N is contra $N_{eu}gs\alpha^* -$ irresolute , then ${f_N}^{-1}(\mathbb{A}^c) = \left({f_N}^{-1}(\mathbb{A})\right)^c$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow {f_N}^{-1}(\mathbb{A})$ is a $N_{eu}gs\alpha^* - OS$ in $(\mathbb{P}, \tau_{N_{eu}})$.

(2) ⇒ (1) , Let $\mathbb{A}$ be any $N_{eu}gs\alpha^* - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Then $\mathbb{A}^c$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. By hypothesis , ${f_N}^{-1}(\mathbb{A}^c) = \left({f_N}^{-1}(\mathbb{A})\right)^c$ is a $N_{eu}gs\alpha^* - OS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow {f_N}^{-1}(\mathbb{A})$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow f_N$ is contra $N_{eu}gs\alpha^* -$ irresolute .

Theorem 4.15: Let $f_N: (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{Q}, \sigma_{N_{eu}})$ be contra $N_{eu}gs\alpha^* -$ irresolute and $g_N : (\mathbb{Q}, \sigma_{N_{eu}}) \to (\mathbb{R}, \gamma_{N_{eu}})$ be contra $N_{eu}gs\alpha^* -$ continuous , then $g_N o f_N : (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{R}, \gamma_{N_{eu}})$ is $N_{eu}gs\alpha^* -$ continuous.

Proof: Let $\mathbb{A}$ be any $N_{eu} - CS$ in $(\mathbb{R}, \gamma_{N_{eu}})$. Given g_N is contra $N_{eu}gs\alpha^* -$ continuous , then ${g_N}^{-1}(\mathbb{A})$ is a $N_{eu}gs\alpha^* - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Given f_N is contra $N_{eu}gs\alpha^* -$ irresolute , then ${f_N}^{-1}({g_N}^{-1}(\mathbb{A})) = (g_N o f_N)^{-1}(\mathbb{A})$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow g_N o f_N$ is $N_{eu}gs\alpha^* -$ continuous .

Theorem 4.16: Let $f_N: (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{Q}, \sigma_{N_{eu}})$ be contra $N_{eu}gs\alpha^* -$ irresolute and $g_N : (\mathbb{Q}, \sigma_{N_{eu}}) \to (\mathbb{R}, \gamma_{N_{eu}})$ be $N_{eu}gs\alpha^* -$ continuous , then $g_N o f_N : (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{R}, \gamma_{N_{eu}})$ is contra $N_{eu}gs\alpha^* -$ continuous.

Proof: Let $\mathbb{A}$ be any $N_{eu} - OS$ in $(\mathbb{R}, \gamma_{N_{eu}})$. Given g_N is $N_{eu}gs\alpha^* -$ continuous , then ${g_N}^{-1}(\mathbb{A})$ is a $N_{eu}gs\alpha^* - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Given f_N is contra $N_{eu}gs\alpha^*$ –irresolute , then ${f_N}^{-1}({g_N}^{-1}(\mathbb{A})) = (g_N o f_N)^{-1}(\mathbb{A})$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow g_N o f_N$ is contra $N_{eu}gs\alpha^* -$ continuous .

Theorem 4.17: Let $f_N: (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{Q}, \sigma_{N_{eu}})$ be contra $N_{eu} -$ continuous and $g_N : (\mathbb{Q}, \sigma_{N_{eu}}) \to (\mathbb{R}, \gamma_{N_{eu}})$ be contra $N_{eu}gs\alpha^* -$ irresolute . Then $g_N o f_N : (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{R}, \gamma_{N_{eu}})$ is strongly $N_{eu}gs\alpha^* -$ continuous , if $(\mathbb{Q}, \sigma_{N_{eu}})$ is $N_{eu}gs\alpha^* - T_{1/2}$ space .

Proof: Let $\mathbb{A}$ be any $N_{eu}gs\alpha^* - CS$ in $(\mathbb{R}, \gamma_{N_{eu}})$. Given g_N is contra $N_{eu}gs\alpha^* -$ irresolute , then ${g_N}^{-1}(\mathbb{A})$ is a

$N_{eu}gs\alpha^* - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Given $(\mathbb{Q}, \sigma_{N_{eu}})$ is $N_{eu}gs\alpha^* - T_{1/2}$ space , then $g_N{}^{-1}(\mathbb{A})$ is a $N_{eu} - OS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Given f_N is contra N_{eu} − continuous , then $f_N{}^{-1}(g_N{}^{-1}(\mathbb{A})) = (g_N o f_N)^{-1}(\mathbb{A})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow g_N o f_N$ is strongly $N_{eu}gs\alpha^*$ − continuous .

Theorem 4.18: Let $f_N: (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{Q}, \sigma_{N_{eu}})$ be $N_{eu}gs\alpha^*$ − irresolute and $g_N : (\mathbb{Q}, \sigma_{N_{eu}}) \to (\mathbb{R}, \gamma_{N_{eu}})$ be contra $N_{eu}gs\alpha^*$ − irresolute , then $g_N o f_N : (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{R}, \gamma_{N_{eu}})$ is contra $N_{eu}gs\alpha^*$ − irresolute .

Proof: Let $\mathbb{A}$ be any $N_{eu}gs\alpha^* - OS$ in $(\mathbb{R}, \gamma_{N_{eu}})$. Given g_N is contra $N_{eu}gs\alpha^*$ − irresolute , then $g_N{}^{-1}(\mathbb{A})$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Given f_N is $N_{eu}gs\alpha^*$ − irresolute , then $f_N{}^{-1}(g_N{}^{-1}(\mathbb{A})) = (g_N o f_N)^{-1}(\mathbb{A})$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow g_N o f_N$ is contra $N_{eu}gs\alpha^*$ − irresolute .

Theorem 4.20: Let $f_N: (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{Q}, \sigma_{N_{eu}})$ be strongly $N_{eu}gs\alpha^*$ − continuous and $g_N : (\mathbb{Q}, \sigma_{N_{eu}}) \to (\mathbb{R}, \gamma_{N_{eu}})$ be contra $N_{eu}gs\alpha^*$ − irresolute , then $g_N o f_N : (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{R}, \gamma_{N_{eu}})$ is contra $N_{eu}gs\alpha^*$ − irresolute .

Proof: Let $\mathbb{A}$ be any $N_{eu}gs\alpha^* - OS$ in $(\mathbb{R}, \gamma_{N_{eu}})$. Given g_N is contra $N_{eu}gs\alpha^*$ − irresolute , then $g_N{}^{-1}(\mathbb{A})$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Given f_N is strongly $N_{eu}gs\alpha^*$ − continuous , then $f_N{}^{-1}(g_N{}^{-1}(\mathbb{A})) = (g_N o f_N)^{-1}(\mathbb{A})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow (g_N o f_N)^{-1}(\mathbb{A})$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow g_N o f_N$ is contra $N_{eu}gs\alpha^*$ − irresolute .

Theorem 4.21: Let $f_N: (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{Q}, \sigma_{N_{eu}})$ be perfectly $N_{eu}gs\alpha^*$ − continuous and $g_N : (\mathbb{Q}, \sigma_{N_{eu}}) \to (\mathbb{R}, \gamma_{N_{eu}})$ be contra $N_{eu}gs\alpha^*$ − irresolute , then $g_N o f_N : (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{R}, \gamma_{N_{eu}})$ is contra $N_{eu}gs\alpha^*$ − irresolute .

Proof: Let $\mathbb{A}$ be any $N_{eu}gs\alpha^* - OS$ in $(\mathbb{R}, \gamma_{N_{eu}})$. Given g_N is contra $N_{eu}gs\alpha^*$ − irresolute , then $g_N{}^{-1}(\mathbb{A})$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Given f_N is perfectly $N_{eu}gs\alpha^*$ − continuous , then $f_N{}^{-1}(g_N{}^{-1}(\mathbb{A})) = (g_N o f_N)^{-1}(\mathbb{A})$ is both $N_{eu} - OS$ and $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow (g_N o f_N)^{-1}(\mathbb{A})$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow g_N o f_N$ is contra $N_{eu}gs\alpha^*$ − irresolute.

Theorem 4.22: Let $f_N: (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{Q}, \sigma_{N_{eu}})$ and $g_N : (\mathbb{Q}, \sigma_{N_{eu}}) \to (\mathbb{R}, \gamma_{N_{eu}})$ be contra $N_{eu}gs\alpha^*$ − irresolute . Then $g_N o f_N : (\mathbb{P}, \tau_{N_{eu}}) \to (\mathbb{R}, \gamma_{N_{eu}})$ is contra $N_{eu}gs\alpha^*$ − irresolute , if $(\mathbb{P}, \tau_{N_{eu}})$ is $N_{eu}gs\alpha^*$ − locally indiscrete space .

Proof: Let $\mathbb{A}$ be any $N_{eu}gs\alpha^* - OS$ in $(\mathbb{R}, \gamma_{N_{eu}})$. Given g_N is contra $N_{eu}gs\alpha^*$ − irresolute , then $g_N{}^{-1}(\mathbb{A})$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{Q}, \sigma_{N_{eu}})$. Given f_N is contra $N_{eu}gs\alpha^*$ − irresolute , then $f_N{}^{-1}(g_N{}^{-1}(\mathbb{A})) = (g_N o f_N)^{-1}(\mathbb{A})$ is a $N_{eu}gs\alpha^* - OS$ in $(\mathbb{P}, \tau_{N_{eu}})$. Since $(\mathbb{P}, \tau_{N_{eu}})$ is $N_{eu}gs\alpha^*$ − locally indiscrete space , then $(g_N o f_N)^{-1}(\mathbb{A})$ is a $N_{eu} - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow (g_N o f_N)^{-1}(\mathbb{A})$ is a $N_{eu}gs\alpha^* - CS$ in $(\mathbb{P}, \tau_{N_{eu}}) \Rightarrow g_N o f_N$ is contra $N_{eu}gs\alpha^*$ − irresolute .

5 Conclusions

In this paper we have discussed about Strongly contra $N_{eu}gs\alpha^*$ − continuous and contra $N_{eu}gs\alpha^*$ − irresolute map . We had an idea to extend this paper to the next level about almost contra $N_{eu}gs\alpha^*$ − continuous and also the application of this paper . In future work , we will discussed and find out the results of this paper application.

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Conflicts of Interest

The authors declare that there is no conflicts of interest in the research .

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