Rough Interval Valued Intuitionistic Fuzzy Ideals in Γ -Semigroups

V. S. Subha¹, P. Dhanalakshmi²

¹Assistant Professor, Department of Mathematics,
Govt. Arts College, C.Mutlur, Chidambaram-608102.

²Research Scholar, Annamalai University.

Abstract

The spot of this paper is to present the opportunity of earth shattering stretch regarded intuitionistic cushioned fixations in Γ a few its properties. We other than show the chance of repulsive freedom regarded intuitionistic cushioned left (right, two-sided, bi-, (1,2)-) appraisals in Γ a couple of properties of these norms.. Index terms: Brutal reach regarded intuitionistic cushioned set, horrible spread regarded intuitionistic tricky left (right) inclines, savage stretch regarded intuitionistic warm bi-ideal, loathsome freedom considered intuitionistic satisfying (1,2)- ideal.

1. Introduction

Zadeh [1] introduced cushioned set as a focal mathematical instrument to depict and amassing the things whose cutoff is dull. Various experts have related themselves in enhancing the pieces of information and aftereffects of the unadulterated variable-based math to cushioned set. The upset set speculation began by Pawlak [7] is a beast mathematical model to oversee shadowiness and granularity to the level of approximations. Pawlak and Skowron [8] set up express levels of progress on savage sets to figure spaces. Kuroki introduced the opportunity of horrible guidelines in semigroups. Xiao development Zhang [14] studied unforgiving prime norms and disturbing woolen prime fights in semigroups. In 1986 Atanassov [1] presented the intuitionistic sensitive sets as theory of satisfying sets. Jayanta Ghosh et al. [4] introduced savage intuitionistic fragile principles in semigroups. Atanassov et al. [1,2] introduced range regarded intuitionistic warm sets, a hypothesis of both astonishing intuitionistic sets and stretch considered sensitive sets. A couple of experts applied field-saw intuitionistic cushioned sets to arithmetical new developments. Subha et al. [10,11] introduced the numerical plans of guaranteed appear at regarded cushioned sets. Subha et al. [12] surveyed the opportunity of shocking stretch kept cushioned standards in gamma-semigroups.

Preliminaries

This part deals with the immense definitions [1-16], which will be relied upon in this work. In this paper, nearby if disregarding passed on unequivocally, G continually loosens up a Γ -semigroup with character.

Rough Interval Valued Intuitionistic Fuzzy Subsets (RIVIFS) In Γ -Semigroup

This section deals with RIVIF sets in Γ -semigroup. Throughout this paper let us denote π as a congruence relation on G .

Let π be a congruence relation on G , ie., π is an equivalence relation on G such that $(a, b) \in \pi \Rightarrow (ayx, byx) \in \pi$ and $(xya, xyb) \in \pi \forall x \in G$.

For a congruence relation π on G , we have $[a]_{\pi} \Gamma [b]_{\pi} \subseteq [a \Gamma b]_{\pi} \forall a, b \in G$. A congruence relation π on G is called complete if $[l]_{\pi} \Gamma [k]_{\pi} = [l \Gamma k]_{\pi}$ for all $l, k \in G$.

Let J be an IIFs of G . Then an IVIF, $\pi_*(J) = (\pi_*(\mu_J), \pi_*(\nu_J))$ and $\pi^*(J) = (\pi^*(\mu_J), \pi^*(\nu_J))$ are respectively called π -lower and π -upper approximation of J where $\forall l \in G$,

$$\pi_*(\mu_J)(l) = \bigwedge_{a \in [l]_{\pi}} \mu_J(a), \quad \pi_*(\nu_J)(l) = \bigvee_{a \in [l]_{\pi}} \nu_J(a) \quad \text{and} \\ \pi^*(\mu_J)(l) = \bigvee_{a \in [x]_{\pi}} \mu_J(a), \quad \pi^*(\nu_J)(l) = \bigwedge_{a \in [l]_{\pi}} \nu_J(a)$$

for an IVIF J of G . $\pi(J) = (\pi_*(J), \pi^*(J))$ is called RIVIF set with respect to π if $\pi_*(J) \neq \pi^*(J)$.

Note: $\pi_*(\mu_J)(l) + \pi_*(\nu_J)(l) = \bigwedge_{a \in [l]_\pi} \mu_J(a) + \bigvee_{a \in [l]_\pi} \nu_J(a) \leq \bigwedge_{a \in [l]_\pi} \mu_J(a) + \bigvee_{a \in [l]_\pi} (1 - \mu_J(a))$
 $= \bigwedge_{a \in [l]_\pi} \mu_J(a) + 1 - \bigwedge_{a \in [l]_\pi} \mu_J(a) = 1$

Similarly $\pi^*(\mu_J)(x) + \pi^*(\nu_J)(x) \leq 1$ for all $l \in G$. This proves that $\pi_*(J) = (\pi_*(\mu_J), \pi_*(\nu_J))$ and $\pi^*(J) = (\pi^*(\mu_J), \pi^*(\nu_J))$ are *IVIF* set of G .

Theorem.3.1. Let π and φ be two congruence relation of G . If J and K are any two *IVIF* sets of G , then the following conditions are holds:

- (i) $\pi_*(J) \subseteq J \subseteq \pi^*(J)$
- (ii) $\pi_*(\pi_*(J)) = \pi_*(J)$
- (iii) $\pi^*(\pi^*(J)) = \pi^*(J)$
- (iv) $\pi^*(\pi_*(J)) = \pi_*(J)$
- (v) $\pi_*(\pi^*(J)) = \pi^*(J)$
- (vi) $(\pi^*(J^c))^c = \pi_*(J)$
- (vii) $(\pi_*(J^c))^c = \pi^*(J)$
- (viii) $\pi_*(J \cap K) = \pi_*(J) \cap \pi_*(K)$
- (ix) $\pi^*(J \cap K) = \pi^*(J) \cap \pi^*(K)$
- (x) $\pi^*(J \cup K) = \pi^*(J) \cup \pi^*(K)$
- (xi) $\pi_*(J \cup K) \supseteq \pi_*(J) \cup \pi_*(K)$
- (xii) $J \subseteq K \Rightarrow \pi_*(J) \subseteq \pi_*(K)$
- (xiii) $J \subseteq K \Rightarrow \pi^*(J) \subseteq \pi^*(K)$
- (xiv) $\theta \subseteq \varphi \Rightarrow \pi_*(J) \supseteq \varphi_*(J)$
- (xv) $\theta \subseteq \varphi \Rightarrow \pi^*(J) \subseteq \varphi^*(J)$

Theorem.3.2. Let π be a congruence relation of G . If J and K are any two *IVIF* of G , then $\pi^*(J) \circ \pi^*(K) \subseteq \pi^*(J \circ K)$.

Proof: Let $J = (\mu_J, \nu_J), K = (\mu_K, \nu_K)$ be any two *IVIF* of G . Then

$$\pi^*(J) \circ \pi^*(K) = (\pi^*(\mu_J) \circ \pi^*(\mu_K), \pi^*(\nu_J) \circ \pi^*(\nu_K)) \text{ and}$$

$$\pi^*(J \circ K) = (\pi^*(\mu_J \circ \mu_K), \pi^*(\nu_J \circ \nu_K)).$$

To show $\pi^*(J) \circ \pi^*(K) \subseteq \pi^*(J \circ K)$, for that we have to prove that for all $l \in G$

$$(\pi^*(\mu_J) \circ \pi^*(\mu_K))(l) \leq \pi^*(\mu_J \circ \mu_K)(l) \text{ and}$$

$$(\pi^*(\nu_J) \circ \pi^*(\nu_K))(l) \geq \pi^*(\nu_J \circ \nu_K)(l).$$

Now for all $l \in G$

$$\begin{aligned} (\pi^*(\mu_J) \circ \pi^*(\mu_K))(l) &= \bigvee_{l=p\gamma q} [\pi^*(\mu_J)(p) \wedge \pi^*(\mu_K)(q)] \\ &= \bigvee_{l=p\gamma q} [(\bigvee_{a \in [p]_\pi} \mu_J(a)) \wedge (\bigvee_{b \in [q]_\pi} \mu_K(b))] \\ &= \bigvee_{l=p\gamma q} [\bigvee_{a \in [p]_\pi, b \in [q]_\pi} (\mu_J(a) \wedge \mu_K(b))] \end{aligned}$$

$$\begin{aligned}
&\leq \bigvee_{l=p\gamma q} \left[\bigvee_{a\gamma b \in [p\gamma q]_\pi} (\mu_J(a) \wedge \mu_K(b)) \right], \\
&= \bigvee_{a\gamma b \in [l]_\pi} (\mu_J(a) \wedge \mu_K(b)), \\
&= \bigvee_{\alpha \in [l]_\pi, \alpha = a\gamma b} (\mu_J(a) \wedge \mu_K(b)) \\
&= \bigvee_{\alpha \in [l]_\pi} \bigvee_{\alpha = a\gamma b} (\mu_J(a) \wedge \mu_K(b)) \\
&= \bigvee_{\alpha \in [l]_\pi} (\mu_J \circ \mu_K)(\alpha) \\
&= \pi^*(\mu_J \circ \mu_K)(l)
\end{aligned}$$

Again,

$$\begin{aligned}
(\pi^*(\mu_J) \circ \pi^*(\mu_K))(l) &= \bigwedge_{l=p\gamma q} [\pi^*(\mu_J)(p) \vee \pi^*(\mu_K)(q)] \\
&= \bigwedge_{l=p\gamma q} [(\bigwedge_{a \in [p]_\pi} \mu_J(a)) \vee (\bigwedge_{b \in [q]_\pi} \mu_K(b))] \\
&= \bigwedge_{l=p\gamma q} [\bigwedge_{\alpha \in [l]_\pi, \alpha = a\gamma b} (\mu_J(a) \vee \mu_K(b))] \\
&\geq \bigwedge_{l=p\gamma q} [\bigwedge_{a\gamma b \in [p\gamma q]_\pi} (\mu_J(a) \vee \mu_K(b))] \\
&= \bigwedge_{a\gamma b \in [l]_\pi} (\mu_J(a) \vee \mu_K(b)), \\
&= \bigwedge_{\alpha \in [l]_\pi, \alpha = a\gamma b} (\mu_J(a) \vee \mu_K(b)) \\
&= \bigwedge_{\alpha \in [l]_\pi} \bigwedge_{\alpha = a\gamma b} (\mu_J(a) \vee \mu_K(b)) \\
&= \bigwedge_{\alpha \in [l]_\pi} (\mu_J \circ \mu_K)(\alpha) = \pi^*(\mu_J \circ \mu_K)
\end{aligned}$$

Thus we have $\pi^*(J) \circ \pi^*(K) \subseteq \pi^*(J \circ K)$.

Theorem.3.3. Let π be a congruence relation of G . If J and K are any two *IVIF* set of G , then $\pi_*(J) \circ \pi_*(K) \subseteq \pi_*(J \circ K)$.

Proof: Since π is complete congruence relation on G . Let $J = (\mu_J, \nu_J), K = (\mu_K, \nu_K)$ be any two *IIF* of G .

$$\begin{aligned}
\text{Then } \pi_*(J) \circ \pi_*(K) &= (\pi_*(\mu_J) \circ \pi_*(\mu_K), \pi_*(\nu_J) \circ \pi_*(\nu_K)) \text{ and} \\
\pi_*(J \circ K) &= (\pi_*(\mu_J \circ \mu_K), \pi_*(\nu_J \circ \nu_K)).
\end{aligned}$$

To show $\pi_*(J) \circ \pi_*(K) \subseteq \pi_*(J \circ K)$. We have to prove that for all $l \in G$

$$\begin{aligned}
(\pi_*(\mu_J) \circ \pi_*(\mu_K))(l) &= \bigwedge_{l=p\gamma q} [\pi_*(\mu_J)(p) \vee \pi_*(\mu_K)(q)] \\
&= \bigwedge_{l=p\gamma q} [(\bigwedge_{a \in [p]_\pi} \mu_J(a)) \vee (\bigwedge_{b \in [q]_\pi} \mu_K(b))] \\
&= \bigwedge_{l=p\gamma q} [\bigwedge_{\alpha \in [l]_\pi, \alpha = a\gamma b} (\mu_J(a) \vee \mu_K(b))] \\
&\geq \bigwedge_{l=p\gamma q} [\bigwedge_{a\gamma b \in [p\gamma q]_\pi} (\mu_J(a) \vee \mu_K(b))] \\
&= \bigwedge_{a\gamma b \in [l]_\pi} (\mu_J(a) \vee \mu_K(b)), \\
&= \bigwedge_{\alpha \in [l]_\pi, \alpha = a\gamma b} (\mu_J(a) \vee \mu_K(b)) \\
&= \bigwedge_{\alpha \in [l]_\pi} \bigwedge_{\alpha = a\gamma b} (\mu_J(a) \vee \mu_K(b)) \\
&= \bigwedge_{\alpha \in [l]_\pi} (\mu_J \circ \mu_K)(\alpha) = \pi^*(\mu_J \circ \mu_K)
\end{aligned}$$

Again,

$$\begin{aligned}
 (\pi_*(v_J) \circ \pi_*(v_K))(l) &= \bigwedge_{l=p\gamma q} [\pi_*(v_J)(p) \vee \pi_*(v_K)(q)] \\
 &= \bigwedge_{l=p\gamma q} [(\bigwedge_{a \in [p]_\pi} v_J(a)) \vee (\bigwedge_{b \in [q]_\pi} v_K(b))] \\
 &= \bigwedge_{l=p\gamma q} [\bigwedge_{a \in [p]_\pi, b \in [q]_\pi} [v_J(a) \vee v_K(b)]] \\
 &\geq \bigwedge_{l=p\gamma q} [\bigwedge_{a\gamma b \in [p\gamma q]_\pi} (v_J(a) \vee v_K(b))], \\
 &= \bigwedge_{a\gamma b \in [l]_\pi} (v_J(a) \vee v_K(b)), \\
 &= \bigwedge_{a \in [l]_\pi, a\gamma b} (v_J(a) \vee v_K(b)) \\
 &= \bigwedge_{a \in [l]_\pi} \bigwedge_{a\gamma b} (v_J(a) \vee v_K(b)) \\
 &= \bigwedge_{a \in [l]_\pi} (v_J \vee v_K)(a) = \pi_*(v_L \circ v_K)
 \end{aligned}$$

Thus we have $\pi_*(J) \circ \pi_*(K) \subseteq \pi_*(J \circ K)$.

Theorem .3.4. Let π and φ be two congruence relation of G . If J is an *IVIF* set of G then $(\pi \cap \varphi)^*(J) \subseteq \pi^*(J) \cap \varphi^*(J)$.

Proof: We know that $\pi \cap \varphi$ is also a congruence relation on G . Also $\pi \cap \varphi \subseteq \pi$ and $\pi \cap \varphi \subseteq \varphi$. Let J be an *IVIF* set of G . Then by using Theorem 3.2(15) we obtain $(\pi \cap \varphi)^*(L) \subseteq \pi^*(L)$ and $(\pi \cap \varphi)^*(L) \subseteq \varphi^*(L)$. Then we have $(\pi \cap \varphi)^*(L) \subseteq \pi^*(L) \cap \varphi^*(L)$.

Theorem .3.5 Let π and φ be two congruence relation of G . If L is an *IVIF* of G then $(\pi \cap \varphi)_*(L) \subseteq \pi_*(L) \cap \varphi_*(L)$.

Proof: It is easily to observe that $\pi \cap \varphi$ is also a congruence relation on G . Also $\pi \cap \varphi \subseteq \pi$ and $\pi \cap \varphi \subseteq \varphi$.

Let L be an *IVIF* set of G . Then by using Theorem 3.2(14) we obtain $(\pi \cap \varphi)_*(L) \subseteq \pi_*(L)$ and $(\pi \cap \varphi)_*(L) \subseteq \varphi_*(L)$. Therefore $(\pi \cap \varphi)_*(L) \subseteq \pi_*(L) \cap \varphi_*(L)$.

Rough Interval Valued Intuitionistic Fuzzy (Rivifi) Ideals Of Γ -Semigroup

This section introduces the notion of ideal, bi-ideal, and (1,2)-ideal. Then, more exciting properties are proved.

Definition.4.1 Let π be a congruence relation on M . An *IVIF* J of G is called an upper (lower)-*RIVIF* sub Γ -semigroup of G if $\pi_*(J)(\pi_*(J))$ is an *IVIF* sub- Γ -semigroup of G .

J is called a *RIVIF* sub- Γ -semigroup of G if it is both upper and lower-*RIVIF* sub- Γ -semigroup of G .

Theorem.4.2. Let π be a congruence relation on G . If J is an *IVIF* sub- Γ -semigroup of G , then L is an upper *RIVIF* sub- Γ -semigroup of G .

Proof: Since J is an *IVIF* sub- Γ -semigroup of G and $l, k \in G$ and $\gamma \in \Gamma$.

Then

$$\begin{aligned}\pi^*(\mu_J)(l\gamma k) &= \bigvee_{p \in [l\gamma k]_\pi} \mu_J(p) \\ &\geq \bigvee_{p \in [l]_\pi \gamma [k]_\pi} \mu_J(p) \\ &= \bigvee_{q\gamma r \in [l]_\pi \gamma [k]_\pi} \mu_J(q\gamma r) \\ &\geq \bigvee_{q \in [l]_\pi, r \in [k]_\pi} [\mu_J(q) \wedge \mu_J(r)] \\ &= \bigvee_{q \in [l]_\pi} \mu_J(q) \wedge \bigvee_{r \in [k]_\pi} \mu_J(r) \\ &= \pi^*(\mu_J)(l) \wedge \pi^*(\mu_J)(k).\end{aligned}$$

$$\begin{aligned}\pi^*(\nu_J)(l\gamma k) &= \bigwedge_{p \in [l\gamma k]_\pi} \nu_J(p) \\ &\leq \bigwedge_{p \in [l]_\pi \gamma [k]_\pi} \nu_J(p) \\ &= \bigwedge_{q\gamma r \in [l]_\pi \gamma [k]_\pi} \nu_J(q\gamma r) \\ &\leq \bigwedge_{q \in [l]_\pi, r \in [k]_\pi} [\nu_J(q) \vee \nu_J(r)] \\ &= \bigwedge_{q \in [l]_\pi} \nu_J(q) \vee \bigwedge_{r \in [k]_\pi} \nu_J(r) \\ &= \pi^*(\nu_J)(l) \vee \pi^*(\nu_J)(k)\end{aligned}$$

Hence J is an upper *RIVIF* sub- Γ -semigroup of G .

Theorem.4.3. Let π be a congruence relation on G . If J is an *IVIF* sub Γ -semigroup of G , and if π is complete then J is a lower *RIVIF* sub Γ -semigroup of G .

Proof: Let J be an *IVIF* sub- Γ -semigroup of G and $x, y \in G$.

Then

$$\begin{aligned}\pi_*(\mu_J)(l\gamma k) &= \bigwedge_{p \in [l\gamma k]_\theta} \mu_J(p) \\ &= \bigwedge_{p \in [l]_\pi \gamma [k]_\pi} \mu_J(p) \\ &= \bigwedge_{q\gamma r \in [l]_\pi \gamma [k]_\pi} \mu_J(q\gamma r) \\ &\geq \bigwedge_{q \in [l]_\pi, r \in [k]_\pi} \mu_J(p) \\ &= \bigwedge_{q \in [l]_\pi} \mu_J(q) \vee \bigwedge_{r \in [k]_\pi} \mu_J(r) \\ &= \pi_*(\mu_J)(l) \wedge \pi_*(\mu_J)(k)\end{aligned}$$

$$\begin{aligned}\pi_*(\nu_J)(l\gamma k) &= \bigvee_{p \in [l\gamma k]_\theta} \nu_J(p) \\ &= \bigvee_{p \in [l]_\pi \gamma [k]_\pi} \nu_J(p) \\ &= \bigvee_{q\gamma r \in [l]_\pi \gamma [k]_\pi} \nu_J(q\gamma r) \\ &\leq \bigvee_{q \in [l]_\pi, r \in [k]_\pi} [\nu_J(q) \vee \nu_J(r)] \\ &= \bigvee_{q \in [l]_\pi} \nu_J(q) \vee \bigvee_{r \in [k]_\pi} \nu_J(r) \\ &= \pi_*(\nu_J)(l) \vee \pi_*(\nu_J)(k).\end{aligned}$$

This shows that $\pi_*(J)$ is an *IVIF* sub- Γ -semigroup of G .

Definition.4.4 Let π be a congruence relation on M . An $IVIF$ J of G is called an upper (lower)- $RIVIF$ left(right, two-sided)-ideal of G if $\pi_*(J)(\pi_*(J))$ is an $IVIF$ left(right, two-sided)-ideal of G .

J is called a $RIVIF$ left(right, two-sided)-ideal of G if it is both upper and lower- $RIVIF$ left(right, two-sided)-ideal of G .

Theorem.4.5. Let π be a congruence relation on M . If J is an $IVIF$ left(right,two-sided)ideal of G , then

- (i) J is an upper $RIVIF$ left (right,two-sided) ideal of G .
- (ii) If π is complete, then J is lower $RIVIF$ left(right,two-sided)ideal of G .

Proof: Let I be an $IVIF$ left ideal of G . $g, h \in G$ and $\gamma \in \Gamma$.

$$\begin{aligned}
 (i) \quad \pi^*(\mu_J)(l\gamma k) &= \bigvee_{p \in [l\gamma k]_{\pi}} \mu_J(p) \\
 &\geq \bigvee_{p \in [l]_{\pi} \gamma [k]_{\pi}} \mu_J(p) \\
 &= \bigvee_{q\gamma r \in [l]_{\pi} \gamma [k]_{\pi}} \mu_J(q\gamma r) \\
 &\geq \bigvee_{r \in [k]_{\pi}} \mu_J(r) \\
 &= \pi^*(\mu_J)(k). \\
 \pi^*(v_J)(l\gamma k) &= \bigwedge_{p \in [l\gamma k]_{\pi}} v_J(p) \\
 &\leq \bigwedge_{p \in [l]_{\pi} \gamma [k]_{\pi}} v_J(p) \\
 &= \bigwedge_{q\gamma r \in [l]_{\pi} \gamma [k]_{\pi}} v_J(q\gamma r) \\
 &\leq \bigwedge_{r \in [k]_{\pi}} v_J(r) \\
 &= \pi^*(v_J)(k)
 \end{aligned}$$

This shows that $\pi^*(I)$ is an $IVIF$ left ideal of G . Therefore J is an upper $RIVIF$ left ideal of G . Similarly we can prove the other cases.

(ii) Similar to (i).

Definition.4.6 Let π be a congruence relation on G . An $IVIF$ set B of G is called an upper (lower)- $RIVIF$ bi-ideal of G if $\pi_*(B)(\pi_*(B))$ is an $IVIF$ bi-ideal of G . B is called a $RIVIF$ bi-ideal of G if it is both upper and lower- $RIVIF$ bi-ideal of G .

Theorem.4.8. Let π be a congruence relation on G . If I is an $IVIF$ bi-ideal of G , then I is an upper $RIVIF$ bi-ideal of G .

Proof: Let I be an $IVIF$ bi-ideal of G and $l, m, n \in G$ and $\alpha, \beta \in \Gamma$. Then

$$\begin{aligned}
 \pi^*(\mu_I)(l\alpha m\beta n) &= \bigvee_{p \in [l\alpha m\beta n]_{\pi}} \mu_I(p) \\
 &\geq \bigvee_{p \in [l]_{\pi} \alpha [m]_{\pi} \beta [n]_{\pi}} \mu_I(p) \\
 &= \bigvee_{q\alpha r\beta s \in [l]_{\pi} \alpha [m]_{\pi} \beta [n]_{\pi}} \mu_I(q\alpha r\beta s) \\
 &\geq \bigvee_{q \in [l]_{\pi}, r \in [m]_{\pi}, s \in [n]_{\pi}} [\mu_I(q) \wedge \mu_I(s)]
 \end{aligned}$$

$$\begin{aligned}
&= \bigvee_{q \in [l]_{\pi}, s \in [n]_{\pi}} [\mu_I(q) \wedge \mu_I(s)] \\
&= \bigvee_{q \in [l]_{\pi}} \mu_I(q) \wedge \bigvee_{s \in [n]_{\pi}} \mu_I(s) \\
&= \pi^*(\mu_I)(l) \wedge \pi^*(\mu_I)(n).
\end{aligned}$$

Similarly we can prove $\pi^*(v_I)(l \alpha m \beta n) \leq \pi^*(v_I)(l) \vee \pi^*(v_I)(n)$. Hence $\pi^*(I)$ is an *IVIF* bi-ideal of G . Therefore I is an upper *RIVIF* bi-ideal of G .

By similar arguments we can prove the following theorem.

Theorem.4.9. Let π be a congruence relation on M . If I is an *IVIF* bi-ideal of G , then I is an lower *RIVIF* bi-ideal of G .

Definition.4.4 Let π be a congruence relation on M . An *IVIF* set J of G is called an upper (lower)-*RIVIF* (1,2)-ideal of G if $\pi_*(J)(\pi_*(J))$ is an *IVIF* (1,2)-ideal of G . J is called a *RIVIF* (1,2)-ideal of G if it is both upper and lower-*RIVIF* (1,2)-ideal of G .

Theorem.4.10. Let π be a congruence relation on M . If I is an *IVIF* (1,2)-ideal of G , then it is an upper *RIVIF* (1,2)-ideal of G .

Proof: Proof is similar to Theorem 4.8.

Theorem.4.11. Let π be a congruence relation on M . If I is an *IVIF* (1,2)-ideal of G , then it is an lower *RIVIF* (1,2)-ideal of G .

Proof: Proof is similar to Theorem 4.9.

Theorem.4.12. Let π be a congruence relation on M . If L and M are *IVIF* left ideal and *IVIF* right ideal of G respectively. Then $\pi^*(L \circ M) \subseteq \pi^*(L) \cap \pi^*(M)$.

Proof: Let L and M be *IVIF* left ideal and *IVIF* right ideal of G , respectively.

Then $\pi^*(L \circ M) = (\pi^*(\mu_L \circ \mu_M), \pi^*(v_L \circ v_M))$ and

$$\pi^*(L) \cap \pi^*(M) = (\pi^*(\mu_L) \cap \pi^*(\mu_M), \pi^*(v_L) \cup \pi^*(v_M)).$$

To prove $\pi^*(L \circ M) \subseteq \pi^*(L) \cap \pi^*(M)$.

For that we have to prove for all $k \in G$ and $\gamma \in \Gamma$,

$$\pi^*(\mu_L \circ \mu_M)(k) \leq (\pi^*(\mu_L) \cap \pi^*(\mu_M))(k) \text{ and}$$

$$\pi^*(v_L \circ v_M)(k) \geq (\pi^*(v_L) \cap \pi^*(v_M))(k).$$

Now for all $k \in G$,

$$\begin{aligned}
\pi^*(\mu_L \circ \mu_M)(k) &= \bigvee_{n \in [k]_{\pi}} (\mu_L \circ \mu_M)(n) \\
&= \bigvee_{n \in [k]_{\pi}} \bigvee_{n=p\gamma q} [\mu_L(p) \wedge \mu_M(q)] \\
&= \bigvee_{n \in [k]_{\pi}} [\mu_L(p) \wedge \mu_M(q)] \\
&\leq \bigvee_{n \in [k]_{\pi}} \bigvee_{n \in [k]_{\pi}} [\mu_L(p) \wedge \mu_M(q)] \\
&= \bigvee_{n \in [k]_{\pi}} \mu_L(p) \wedge \bigvee_{n \in [k]_{\pi}} \mu_M(q) \\
&= \pi^*(\mu_L)(k) \wedge \pi^*(\mu_M)(k) \\
&= (\pi^*(\mu_L) \cap \pi^*(\mu_M))(k)
\end{aligned}$$

Similarly we have to prove $\pi^*(v_L \circ v_M)(k) \geq (\pi^*(v_L) \cap \pi^*(v_M))(k)$.

Hence $\pi^*(L \circ M) \subseteq \pi^*(L) \cap \pi^*(M)$.

Theorem.4.13. Let π be a congruence relation on M . If L and M are *IVIF* left ideal and *IVIF* right ideal of G respectively. Then $\pi_*(L \circ M) \subseteq \pi_*(L) \cap \pi_*(M)$.

Proof: Let L and M be *IVIF* left ideal and *IVIF* right ideal of G , respectively.

Then $\pi_*(L \circ M) = (\pi_*(\mu_L \circ \mu_M), \pi_*(\nu_L \circ \nu_M))$ and
 $\pi_*(L) \cap \pi_*(M) = (\pi_*(\mu_L) \cap \pi_*(\mu_M), \pi_*(\nu_L) \cup \pi_*(\nu_M))$.

To show that $\pi_*(L \circ M) \subseteq \pi_*(L) \cap \pi_*(M)$ we have to prove for all $k \in G$ and $\gamma \in \Gamma$,

$$\begin{aligned}\pi_*(\mu_L \circ \mu_M)(k) &\leq (\pi_*(\mu_L) \cap \pi_*(\mu_M))(k) \text{ and} \\ \pi_*(\nu_L \circ \nu_M)(k) &\geq (\pi_*(\nu_L) \cap \pi_*(\nu_M))(k).\end{aligned}$$

Now for all $k \in G$,

$$\begin{aligned}\pi_*(\mu_L \circ \mu_M)(x) &= \bigwedge_{n \in [k]_\pi} (\mu_L \circ \mu_M)(n) \\ &= \bigwedge_{n \in [k]_\pi} \bigvee_{n=p\gamma q} [\mu_L(p) \wedge \mu_M(q)] \\ &= \bigwedge_{n \in [k]_\pi} [\mu_L(p) \wedge \mu_M(q)] \\ &= \bigwedge_{n \in [k]_\pi} \mu_L(p) \wedge \bigwedge_{n \in [k]_\pi} \mu_M(q) \\ &= \pi_*(\mu_L)(k) \wedge \pi_*(\mu_M)(k) \\ &= (\pi_*(\mu_L) \cap \pi_*(\mu_M))(k)\end{aligned}$$

Similarly we can prove $\pi_*(\nu_L \circ \nu_M)(x) \geq (\pi_*(\nu_L) \cap \pi_*(\nu_M))(x)$.

Hence $\pi_*(L \circ M) \subseteq \pi_*(L) \cap \pi_*(M)$.

CONCLUSION

In this paper, we introduced the chance of vindictive reach regarded intuitionistic cushioned sets. Likewise, study the logarithmic properties of disturbing substances considered intuitionistic cushioned areas. Other than some frustrating properties of an unforgiving substance, regarded intuitionistic cushioned standards in Γ -semigroup are surveyed. Later on, we discharge up this longing to propose semigroup, suggested Γ -semigroup, etc

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