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Bipolar Vague Contra α Generalized Closed Mappings in Topological Spaces

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Abstract: This paper is dedicated to the learning of bipolar vague topological spaces. In this paper we present the bipolar vague contra α generalized closed mappings and bipolar vague contra α generalized open mappings. Some of their belongings of bipolar vague contra α generalized closed mappings and bipolar vague contra α generalized open mappings are discussed.
Keywords: Bipolar vague topology, bipolar vague α generalized closed sets, bipolar vague contra α generalized closed mappings and bipolar vague contra α generalized open mappings.

I. INTRODUCTION

Uncertain set was familiarized by L.A.Zadeh [12] in 1965. The thought of fuzzy topology was announced by C.L.Chang [3] in 1968. The generalized closed sets in general topology presented by N.Levine [9] in 1970. K.Atanassov [2] in 1986 announced the perception of intuitionistic fuzzy sets. The belief of vague set theory was familiarized by W.L.Gau and D.J.Buehrer [7] in 1993. D.Coker [6] in 1997 familiarized intuitionistic fuzzy topological spaces. Bipolar- valued fuzzy sets, which was announced by K.M.Lee [8] in 2000 is a postponement of fuzzy sets whose membership degree range is inflamed from the interval [0, 1] to [-1,1]. A creative class of generalized bipolar vague sets obtainable by S.Cicily Flora and I.Arockiarani [4] in 2016. We have presented bipolar vague α generalized closed sets [10] in 2024. In this paper we familiarize bipolar vague contra α generalized closed mappings and bipolar vague contra α generalized open mappings and premeditated its basic properties. We deliver some characterizations of bipolar vague contra α generalized closed mappings and bipolar vague contra α generalized open mappings

II. PRELIMINARIES

At this point in this paper the bipolar vague topological spaces are designated by (G, BV_τ). Also, the bipolar vague interior, bipolar vague closure of a bipolar vague set F are denoted by BVInt(F) and BVCl(F). The complement of a bipolar vague set F is denoted by F^c and the empty set and whole sets are denoted by $0_\sim$ and $1_\sim$ individually.

Definition 2.1: [8] Let G be the universe. Then a bipolar valued fuzzy sets, F on G is defined by positive membership function μ_F^+, that is μ_F^+: G→ [0,1], and a negative membership function μ_F^-, that is μ_F^-: G→ [-1,0]. For the sake of simplicity, we shall use the symbol $F = \{\langle g, \mu_F^+(g), \mu_F^-(g)\rangle : g \in G\}$.

Definition 2.2: [8] Let F and E be two bipolar valued fuzzy sets then their union, intersection and complement are defined as follows:

(i) $\mu_{F\cup E}^+ = \max\{\mu_F^+(g), \mu_E^+(g)\}$

(ii) $\mu_{F\cup E}^- = \min\{\mu_F^-(g), \mu_E^-(g)\}$

(iii) $\mu_{F\cap E}^+ = \min\{\mu_F^+(g), \mu_E^+(g)\}$

(iv) $\mu_{F\cap E}^- = \max\{\mu_F^-(g), \mu_E^-(g)\}$

(v) $\mu_{F^c}^+(g) = 1-\mu_F^+(g)$ and $\mu_{F^c}^-(g) = -1-\mu_F^-(g)$ for all $g \in G$.

Definition 2.3: [7] A vague set F in the universe of discourse L is a pair of (t_F, f_F) where t_F: L→[0,1], f_F: L→[0,1] are the mapping such that $t_F + f_F \leq 1$ for all $l \in L$. The function t_F and f_F are called true membership function and false membership function respectively. The interval $[t_F, 1 - f_F]$ is called the vague value of l in F, and denoted by $\nu_F(l)$, that is $\nu_F(l) = [t_F(l), 1 - f(l)]$.

Definition 2.4: [7] Let F be a non-empty set and the vague set F and E in the form $F = \{\langle g, t_F(g), 1 - f_F(g)\rangle : g \in G\}$, $E = \{\langle g, t_E(g), 1 - f_E(g)\rangle : g \in G\}$. Then

(i) $F \subseteq E$ if and only if $t_F(g) \leq t_E(g)$ and $1 - f_F(g) \leq 1 - f_E(g)$

(ii) $F \cup E = \{\langle \max(t_F(g), t_E(g)), \max(1 - f_F(g), 1 - f_E(g))\rangle / g \in G\}$.

(iii) F ∩ E = $\{\langle \min(t_F(g), t_E(g)), \min(1 - f_F(g), 1 - f_E(g))\rangle / g \in G\}$.

(iv) $F^c = \{\langle g, f_F(g), 1 - t_F(g)\rangle : g \in G\}$.

Definition 2.5: [1] Let G be the universe of discourse. A bipolar-valued vague set F in G is an object having the form F = $\{\langle g, [t_F^+(g), 1 - f_F^+(g)], [-1 - f_F^-(g), t_F^-(g)]\rangle : g \in G\}$ where $[t_F^+, 1 - f_F^+]$: G→[0,1] and $[-1 - f_F^-, t_F^-]$: G→[-1,0] are the mapping such that $t_F^+(g) + f_F^+(g) \le 1$ and $-1 \le t_F^- + f_F^-$. The positive membership degree $[t_F^+(g), 1 - f_F^+(g)]$ denotes the satisfaction region of an element g to the property corresponding to a bipolar-valued set F and the negative membership degree $[-1 - f_F^-(g), t_F^-(g)]$ denotes the satisfaction region of g to some implicit counter property of F. For a sake of simplicity, we shall use the notion of bipolar vague set $\nu_F^+ = [t_F^+, 1 - f_F^+]$ and $\nu_F^- = [-1 - f_F^-, t_F^-]$.

Definition 2.6: [5] A bipolar vague set F = $[\nu_F^+, \nu_F^-]$ of a set L with $\nu_F^+ = 0$ implies that $t_F^+ = 0$, $1 - f_F^+ = 0$ and $\nu_F^- = 0$ implies that $t_F^- = 0$, $-1 - f_F^- = 0$ for all g ∈ L is called zero bipolar vague set and it is denoted by 0.

Definition 2.7: [5] A bipolar vague set F = $[\nu_F^+, \nu_F^-]$ of a set L with $\nu_F^+ = 1$ implies that $t_F^+ = 1$, $1 - f_F^+ = 1$ and $\nu_F^- = -1$ implies that $t_F^- = -1$, $-1 - f_F^- = -1$ for all g ∈ L is called unit bipolar vague set and it is denoted by 1.

Definition 2.8: [4] Let F = $\langle g, [t_F^+, 1 - f_F^+], [-1 - f_F^-, t_F^-]\rangle$ and E = $\langle g, [t_E^+, 1 - f_E^+], [-1 - f_E^-, t_E^-]\rangle$ be two bipolar vague sets then their union, intersection and complement are defined as follows:

(i) F ∪ E = $\{\langle g, [t_{F\cup E}^+(g), 1 - f_{F\cup E}^+(g)], [-1 - f_{F\cup E}^-(g), t_{F\cup E}^-(g)]\rangle / g \in G\}$ where
$t_{F\cup E}^+(g) = \max\{t_F^+(g), t_E^+(g)\}$, $t_{F\cup E}^-(g) = \min\{t_F^-(g), t_E^-(g)\}$ and
$1 - f_{F\cup E}^+(g) = \max\{1 - f_F^+(g), 1 - f_E^+(g)\}$,
$-1 - f_{F\cup E}^-(g) = \min\{-1 - f_F^-(g), -1 - f_E^-(g)\}$.

(ii) F ∩ E = $\{\langle g, [t_{F\cap E}^+(g), 1 - f_{F\cap E}^+(g)], [-1 - f_{F\cap E}^-(g), t_{F\cap E}^-(g)]\rangle / g \in G\}$ where
$t_{F\cap E}^+(g) = \min\{t_F^+(g), t_E^+(g)\}$, $t_{F\cap E}^-(g) = \max\{t_F^-(g), t_E^-(g)\}$ and
$1 - f_{F\cap E}^+(g) = \min\{1 - f_F^+(g), 1 - f_E^+(g)\}$,
$-1 - f_{F\cup E}^-(g) = \max\{-1 - f_F^-(g), -1 - f_E^-(g)\}$.

(iii) $F^c = \{\langle g, [f_F^+(g), 1 - t_F^+(g)], [-1 - t_F^-(g), f_F^-(g)]\rangle / g \in G\}$.

Definition 2.9: [4] Let F and E be two bipolar vague sets defined over a universe of discourse G. We say that F ⊆ E if and only if $t_F^+(g) \le t_E^+(g)$, $1 - f_F^+(g) \le 1 - f_E^+(g)$ and $t_F^-(g) \ge t_E^-(g)$, $-1 - f_F^-(g) \ge 1 - f_E^-(g)$ for all g ∈ G.

Definition 2.10: [4] A bipolar vague topology (BVT) on a non-empty set G is a family BV_τ of bipolar vague set in G satisfying the following axioms:

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

(ii) $U_1 \cap U_2 \in BV_\tau$, for any $U_1, U_2 \in BV_\tau$

(iii) $\cup U_i \in BV_\tau$, for any arbitrary family $\{U_i : U_i \in BV_\tau, i \in I\}$.

In this case the pair (G, BV_τ) is called a bipolar vague topological space and any bipolar vague set (BVS) in BV_τ is known as bipolar vague open set in G. The complement F^c of a bipolar vague open set (BVOS) F in a bipolar vague topological space (X, BV_τ) is called a bipolar vague closed set (BVCS) in G.

Definition 2.11: [4] Let (F, BV_τ) be a bipolar vague topological space F= $\langle g, [t_F^+, 1 - f_F^+], [-1 - f_F^-, t_F^-]\rangle$ be a bipolar vague set in G. Then the bipolar vague interior and bipolar vague closure of F are defined by,

BVInt(F) = ∪ {U: U is a bipolar vague open set in F and U ⊆ F},

BVCl(F) = ∩ {I: I is a bipolar vague closed set in F and F⊆ I}.

Note that BVCl(F) is a bipolar vague closed set and BVInt(F) is a bipolar vague open set in G. Further,

(i) A is a bipolar vague closed set in G if and only if BVCl(F) = F,

(ii) A is a bipolar vague open set in G if and only if BVInt(F) = F.

Definition 2.12: [4] Let (G, BV_τ) be a bipolar vague topological space. A bipolar vague set F in (G, BV_τ) is said to be a generalized bipolar vague closed set if BVCl(F) ⊆ U whenever F⊆ U and U is bipolar vague open. The complement of a generalized bipolar vague closed set is generalized bipolar vague open set.

Definition 2.13: [4] Let (G, BV_τ) be a bipolar vague topological space and F be a bipolar vague set in G. Then the generalized bipolar vague closure and generalized bipolar vague interior of F are defined by,

GBVCl(F) = ∩ {U: U is a generalized bipolar vague closed set in G and F⊆ U},

GBInt(F) = ∪ {U: U is a generalized bipolar vague open set in G and F ⊇ U}.

Definition 2.14: [10] A bipolar vague set F of a bipolar vague topological space G, is said to be

(i) a bipolar vague α-open set if F ⊆ BVInt(BVCl(BVInt(F)))

(ii) a bipolar vague pre-open set if F ⊆ BVInt(BVCl(F))
(iii) a bipolar vague semi-open set if F ⊆ BVCl(BVInt(F))
(iv) a bipolar vague semi-α-open set if F ⊆ BVCl(αBVInt(F))
(v) a bipolar vague regular-open set BVInt(BVCl(F)) = F
(vi) a bipolar vague β-open set F ⊆ BVCl(BVInt(BVCl(F))).

Definition 2.15: [10] A bipolar vague set F of a bipolar vague topological space G, is said to be
(i) a bipolar vague α-closed set if BVCl(BVInt(BVCl(F))) ⊆ F
(ii) a bipolar vague pre-closed set if BVCl(BVInt(F)) ⊆ F
(iii) a bipolar vague semi-closed set if BVInt(BVCl(F)) ⊆ F
(iv) a bipolar vague semi-α-closed set if BVInt(αBVCl(F)) ⊆ F
(v) a bipolar vague regular-closed set if BVCl(BVInt(F)) = F
(vi) a bipolar vague β-closed set if BVInt(BVCl(BVInt(F))) ⊆ F.

Definition 2.16: [10] Let F be a bipolar vague set of a bipolar vague topological space (G, BV_τ). Then the bipolar vague α interior and bipolar vague α closure are defined as

BV_αInt(F) = ∪ {U: U is a bipolar vague α-open set in G and U ⊆ F},

BV_αCl(A) = ∩ {T: T is a bipolar vague α-closed set in G and F⊆ T}.

Definition 2.17: [10] A bipolar vague set F in a bipolar vague topological space G, is said to be a bipolar vague α generalized closed set if BV_αCl(F) ⊆ L whenever A⊆ L and L is a bipolar vague open set in G. The complement F^c of a bipolar vague α generalized closed set F is a bipolar vague α generalized open set in G.

Definition 2.18: [11] A bipolar vague topological space (G, BV_τ) is said to be bipolar vague αa $T_{1/2}$(B$V_{\alpha a}T_{1/2}$) space if every bipolar vague α generalized closed set in G is a bipolar vague closed set in G.

Definition 2.19: [11] A bipolar vague topological space (G, BV_τ) is said to be bipolar vague αb $T_{1/2}$(B$V_{\alpha b}T_{1/2}$) space if every bipolar vague α generalized closed set in G is a bipolar vague generalized closed set in G.

III. BIPOLAR VAGUE CONTRA α GENERALIZED CLOSED MAPPINGS IN TOPOLOGICAL SPACES

In this sector, we present bipolar vague contra α generalized closed mappings, bipolar vague contra α generalized open mappings and study about of its belongings.

Definition 3.1: Let f be a mapping from a bipolar vague topological space (G, BV_τ) into a bipolar vague topological space (R, BV_σ). Then f is said to be a bipolar vague contra closed mapping if for every bipolar vague closed set F in G, f(F) is a bipolar vague open set in R.

Definition 3.2: Let f be a mapping from a bipolar vague topological space (G, BV_τ) into a bipolar vague topological space (R, BV_σ). Then f is said to be a bipolar vague contra α-closed mapping if for every bipolar vague closed set F in G, f(F) is a bipolar vague α-open set in R.

Definition 3.3: Let f be a mapping from a bipolar vague topological space (G, BV_τ) into a bipolar vague topological space (R, BV_σ). Then f is said to be a bipolar vague contra generalized closed mapping if for every bipolar vague closed set F in G, f(F) is a bipolar vague generalized open set in R.

Definition 3.4: A mapping : (G, BV_τ) → (R, BV_σ) is called a bipolar vague contra α generalized closed mapping if for every bipolar vague closed set F of (G, BV_τ), f(F) is a bipolar vague α generalized open set in (R, BV_σ).

Example 3.5: Let G = {e, f} and R = {s, t} and F = ⟨g, [0.4, 0.4] [-0.4, -0.4], [0.2, 0.3] [-0.3, -0.2]⟩ and E = ⟨r, [0.2, 0.4] [-0.4, -0.2], [0.2, 0.2] [-0.2, -0.2]⟩. Then τ = {$0_\sim$, F, $1_\sim$} and σ = {$0_\sim$, E, $1_\sim$} are bipolar vague topologies on G and R respectively. Define a mapping f : (G, BV_τ) → (R, BV_σ) by f(e) = s and f(f) = t. The bipolar vague set F^c = ⟨g, [0.6, 0.6] [-0.6, -0.6], [0.7, 0.8] [-0.8, -0.7]⟩ is a bipolar vague closed set in G. Now, f(F^c) = ⟨r, [0.6, 0.6] [-0.6, -0.6], [0.7, 0.8] [-0.8, -0.7]⟩ is a bipolar vague α generalized open set in R as f(F^c)∪ BVInt(BVCl(BVInt(f(F^c)))) = f(F^c) ∪ E = f(F^c) whenever f(F^c) ⊆ $1_\sim$.Therefore f is a bipolar vague contra α generalized closed mapping.

Definition 3.6: A mapping : (G, BV_τ) → (R, BV_σ) is called a bipolar vague contra α generalized open mapping if for every bipolar vague open set F of (G, BV_τ), f(F) is a bipolar vague α generalized closed set in (R, BV_σ).

Example 3.7: Let G = {e,f} and R = {s,t} and F = ⟨g, [0.3, 0.4] [-0.4, -0.3], [0.5, 0.5] [-0.6, -0.6]⟩ and E = ⟨r, [0.1, 0.5] [-0.5, -0.1], [0.5, 0.5] [-0.6, -0.2]⟩. Then τ = {$0_\sim$, F, $1_\sim$} and σ = {$0_\sim$, E, $1_\sim$} are bipolar vague topologies on G and R respectively. Define a mapping f : (G, BV_τ) → (R, BV_σ) by f(e) = s and f(f) = t. The bipolar vague set F = ⟨g, [0.3, 0.4]

[-0.4, -0.3], [0.5, 0.5] [-0.6, -0.6]⟩ is a bipolar vague open set in G. Now, f(F) = ⟨r, [0.3, 0.4] [-0.4, -0.3], [0.5, 0.5] [-0.6, -0.6]⟩ is a bipolar vague α generalized closed set in R as f(F)∪ BVCl(BVInt(BVCl(f(F)))) = f(F) ∪ E^c = E^c ⊆ $1_{\sim}$ whenever f(F) ⊆ $1_{\sim}$.Therefore f is a bipolar vague contra α generalized open mapping.

Proposition 3.8: Every bipolar vague contra closed mapping is a bipolar vague contra α generalized closed mapping but not conversely in general.

Proof: Let : (G, BV_{τ}) → (R, BV_{σ}) be a bipolar vague contra closed mapping. Let F be a bipolar vague closed set in G. Since f is a bipolar vague contra closed mapping, f(F) is a bipolar vague open set in R. Since every bipolar vague open set is a bipolar vague α generalized open set, f(F) is a bipolar vague α generalized open set in R. Hence f is a bipolar vague contra α generalized closed mapping.

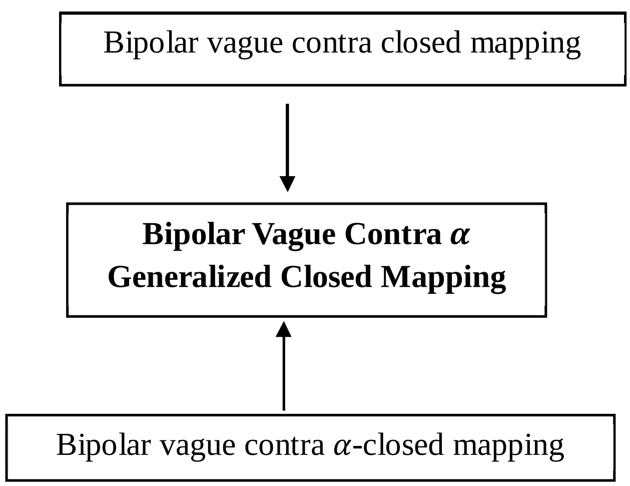
Example 3.9: Let G = {e,f} and R = {s,t} and F = ⟨g, [0.6, 0.6] [-0.6, -0.6], [0.5, 0.8] [-0.8, -0.5]⟩ and E = ⟨r, [0.5, 0.5] [-0.5, -0.5], [0.4, 0.4] [-0.4, -0.4]⟩. Then τ = {$0_{\sim}$, F, $1_{\sim}$} and σ = {$0_{\sim}$, E, $1_{\sim}$} are bipolar vague topologies on G and R respectively. Define a mapping f : (G, BV_{τ}) → (R, BV_{σ}) by f(e) = s and f(f) = t. Then f is a bipolar vague contra α generalized closed mapping but not a bipolar vague contra closed mapping since D = ⟨g, [0.7, 0.7] [-0.7, -0.7], [0.6, 0.9] [-0.9, -0.6]⟩ is a bipolar vague closed set in G but f(H) = ⟨r, [0.7, 0.7] [-0.7, -0.7], [0.6, 0.9] [-0.9, -0.6]⟩is not a bipolar vague open set in R as BVInt(f(H)) = E ≠ f(H).

Proposition 3.10: Every bipolar vague contra α-closed mapping is a bipolar vague contra α generalized closed mapping but not conversely in general.

Proof: Let : (G, BV_{τ}) → (R, BV_{σ}) be a bipolar vague contra α-closed mapping. Let F be a bipolar vague closed set in G. Then by hypothesis, f(F) is a bipolar vague α-open set in R. Since every bipolar vague α-open set is a bipolar vague α generalized open set, f(F) is a bipolar vague α generalized open set in R. Hence f is a bipolar vague contra α generalized closed mapping.

Example 3.11: Let G = {e,f} and R = {s,t} and F = ⟨g, [0.5, 0.5] [-0.5, -0.5], [0.5, 0.7] [-0.7, -0.4]⟩ and E = ⟨r, [0.4, 0.4] [-0.4, -0.4], [0.3, 0.3] [-0.3, -0.3]⟩. Then τ = {$0_{\sim}$, F, $1_{\sim}$} and σ = {$0_{\sim}$, E, $1_{\sim}$} are bipolar vague topologies on G and R respectively. Define a mapping f : (G, BV_{τ}) → (R, BV_{σ}) by f(e) = s and f(f) = t. Then f is a bipolar vague contra α generalized closed mapping but not a bipolar vague contra α-closed mapping since H = ⟨g, [0.6, 0.6] [-0.6, -0.6], [0.5, 0.8] [-0.8, -0.5]⟩ is a bipolar vague closed set in G but f(H) = ⟨r, [0.6, 0.6] [-0.6, -0.6], [0.5, 0.8] [-0.8, -0.5]⟩ is not a bipolar vague α-open set in R as BVInt(BVCl(BVInt(f(H)))) = E ≠ f(H).

The relations between various types of bipolar vague contra closed mappings are given in the following diagram:



Proposition 3.12: A mapping f : (G, BV_{τ}) → (R, BV_{σ}) is a bipolar vague contra α-closed mapping if and only if the image of each bipolar vague open set in G is a bipolar vague α generalized closed set in R.

Proof: Let F be a bipolar vague open set in G. This implies F^c is a bipolar vague closed set in G. Since f is a bipolar vague contra α generalized closed mapping, $f(F^c)$ is a bipolar vague α generalized open set in R. Since $f(F^c) = (f(F))^c$, f(F) is a bipolar vague α generalized closed set in R.

Proposition 3.13: Let : (G, BV_{τ}) → (R, BV_{σ}) be a bipolar vague contra α generalized closed mapping, then f is a bipolar vague contra closed mapping if R is a $BV_{\alpha a}T_{1/2}$ space.

Proof: Let F be a bipolar vague closed set in G. Then f(F) is a bipolar vague α generalized open set in R, by hypothesis. Since R is a B$V_{\alpha a}T_{1/2}$ space, f(F) is a bipolar vague open set in R. Hence f is a bipolar vague contra closed mapping.

Proposition 3.14: Let : (G, BV_τ) → (R, BV_σ) be a bipolar vague contra α generalized closed mapping. Then f is a bipolar vague contra generalized closed mapping if R is a B$V_{\alpha b}T_{1/2}$ space.

Proof: Let F be a bipolar vague closed set in G. Then f(F) is a bipolar vague α generalized open set in R, by hypothesis. Since R is a B$V_{\alpha b}T_{1/2}$ space, f(F) is a bipolar vague generalized open set in R. Hence f is a bipolar vague contra generalized closed mapping.

Proposition 3.14: Let : (G, BV_τ) → (R, BV_σ) be a mapping from a bipolar vague topological space G into a bipolar vague topological space R. Then the following conditions are equivalent if R is a B$V_{\alpha a}T_{1/2}$ space.

(i) f is a bipolar vague contra α generalized closed mapping.
(ii) If F is a bipolar vague open set in G, then f(F) is a bipolar vague α generalized closed set in R.
(iii) BVCl(BVInt(BVCl(f(F)))) ⊆ f(F) for every bipolar vague set F in G.

Proof: (i) ⟹ (ii) is obviously true.

(ii) ⟹ (iii) Let F be any bipolar vague set in G. Then BVInt(F) is a bipolar vague open set in G. Thus f(BVInt(F)) is a bipolar vague α generalized closed set in R. Since R is a B$V_{\alpha a}T_{1/2}$ space, f(BVInt(F)) is a bipolar vague closed set in R. Therefore BVCl(f(BVInt(F))) = f(BVInt(F)). This implies BVCl(BVInt(BVCl(f(F)))) ⊆ f(F).

(iii) ⟹ (i) Let F be a bipolar vague closed set in G. Then its complement F^c is a bipolar vague open set in G. By hypothesis, BVCl(BVInt(BVCl(f(F^c)))) ⊆ f(F^c). Hence f(F^c) is a bipolar vague α-closed set in R. Since every bipolar vague α-closed set is a bipolar vague α generealized closed set, f(F^c) is a bipolar vague α generalized closed set in G. Therefore f(F) is a bipolar vague α generalized open set in G. Hence f is a bipolar vague contra α generalized closed mapping.

Proposition 3.15: Let : (G, BV_τ) → (R, BV_σ) be a bipolar vague closed mapping and g : (R, BV_σ) → (C, BV_δ) be a bipolar vague contra α generalized closed mapping. Then $g \circ f$: (X, BV_τ) → (C, BV_δ) is a bipolar vague contra α generalized closed mapping.

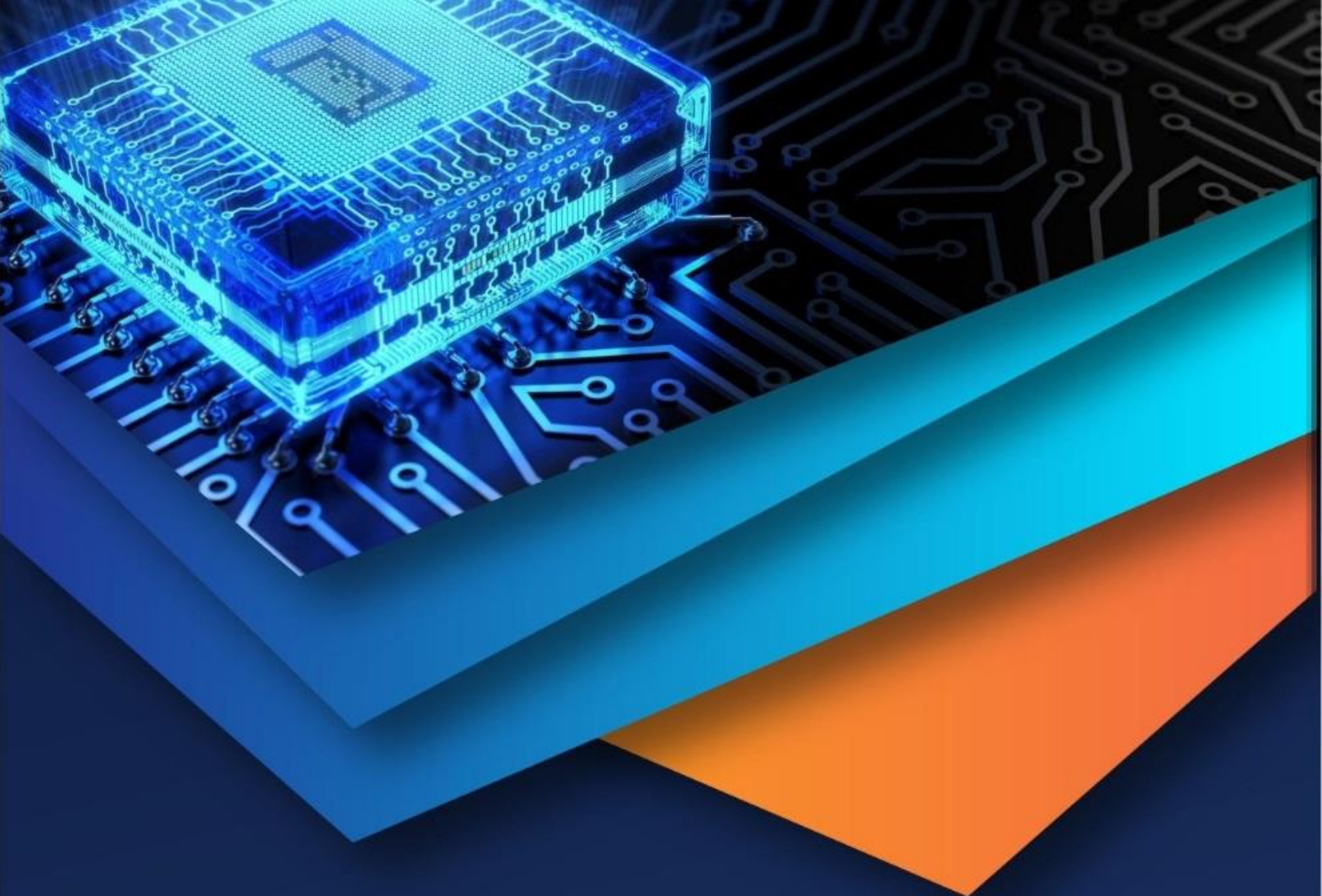
Proof: Let F be a bipolar vague closed set in G. Then f(F) is a bipolar vague closed set in R, by hypothesis. Since g is a bipolar vague contra α generalized closed mapping, g(f(F)) is a bipolar vague α generalized open set in C. Hence $f \circ g$ is a bipolar vague contra α generalized closed mapping.

Proposition 3.16: Let f : (G, BV_τ) → (R, BV_σ) be a bipolar vague contra α generalized closed mapping and R is a B$V_{\alpha b}T_{1/2}$ space, then f(F) is a bipolar vague generalized open set in R for every bipolar vague closed set F in G.

Proof: Let : (G, BV_τ) → (R, BV_σ) be a mapping and let F be a bipolar vague closed set in G. Then by hypothesis f(F) is a bipolar vague α generalized open set in R. Since R is a B$V_{\alpha b}T_{1/2}$ space, f(F) is a bipolar vague generalized open set in R.

REFERENCES

[1] Arockiarani.I and Cicily Flora.S., Positive Implicative bipolar vague ideals in BCK-algebras, International research journal of pure algebra, 2016, 1-7.
[2] Atanassov.K., Intuitionistic fuzzy sets, Fuzzy sets and systems, 1986, 87-96.
[3] Chang.C.L., Fuzzy topological spaces, J Math. Anal. Appl, 1968, 182-190.
[4] Cicily Flora.S and Arockiarani.I., A new class of Generalized bipolar vague sets, International journal of information research and review, 2016, 3058-3065.
[5] Cicily Flora.S and Arockiarani.I., On bipolar vague ring in baire spaces, Bulletin of mathematics and statistics research, 2017, 1-9.
[6] Coker.D., An introduction to intuitionistic fuzzy topological spaces, Fuzzy sets and systems, 1997, 81-89.
[7] Gau.W.L and D.J.Buehrer., Vague sets, IEEE Trans. Systems Man and Cybernet, 1993, 610-614.
[8] Lee.K.M., Bipolar-valued fuzzy sets and their operations, Proc. Int. Conf. on Intelligent technologies, Bangkok, Thailand, 2000, 307-312.
[9] Levine.N., Generalized closed sets in topological spaces, Rend. Circ. Mat. Palermo, 1970, 89-96.
[10] Prishka.F and Mariapresenti.L., Bipolar vague α generalized closed sets in topological spaces, Journal of Basic Science and Engineering, 2024, 1390-1398.
[11] Prishka.F and Mariapresenti.L., Bipolar vague α generalized continuous mappings in topological spaces, Communications on Applied Nonlinear Analysis, 2024, 318-329.
[12] Zadeh.L.A., Fuzzy sets, Informartion and control, 1965, 338-335.



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