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Pairwise bg closed and Pairwise * bg closed set in Bitopological Spaces

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ABSTRACT

*In this paper, we introduce some new classes of sets namely Pairwise bg closed set, Pairwise * bg closed set. We obtain the basic properties and their relationships with other classes of sets in bitopological spaces. We devote the concept of Pairwise bg and Pairwise * bg continuous functions. The relationship between Pairwise bg continuous and Pairwise * bg continuous and other defined continuous functions are being deliberated.*

Keywords and Phrases: *Pairwise bg closed set, Pairwise * bg closed set, Pairwise bg continuous function, Pairwise $*bg$ continuous function, Pairwise bg irresolute function, Pairwise $*bg$ irresolute function.*

I. INTRODUCTION AND PRELIMINARIES

INTRODUCTION

In 1963, J.C.Kelly [11] initiated the study of bitopological spaces. Following him several authors [3, 9, 11, 13, 15] have extended the concepts of topological spaces to bitopological spaces. Mean while Fukutake[8] introduced generalized closed sets and pairwise generalized closure operator in bitopological spaces in 1986. Abo khadra and Nasef [1] discussed b-open sets in bitopological spaces. In this paper we generalize the notions of Pairwise bg closed set, Pairwise * bg closed set in bitopological spaces and their characterizations are discussed. In 1991, K.Balachandran, P.Sundaram and H.Maki [17] defined a new class of mappings called generalized continuous mappings which contains the class of continuous mappings. We use the class of Pairwise bg closed and Pairwise * bg closed sets to develop the concept of continuity in bitopological spaces.

PRELIMINARIES

Definition: 1.1 [15] Let (X, τ) be a topological space. A set A is called semi-open set if A $\subseteq$ C1 (Int (A)). The complement of semi - open set is semi - closed set.

Definition: 1.2 [16] Let (X, τ) be a topological space. A set A is called pre - open set if A $\subseteq$ Int (Cl (A)). The complement of pre - open set is pre - closed set.

Definition: 1.3 [19] Let (X, τ) be a topological space. A set A is called α- open set if A $\subseteq$ int (C1 (int(A))). The complement of α - open set is α - closed set.

Definition: 1.4 [2] Let (X, τ) be a topological space. A set A is called b - open set if A $\subseteq$ C1 (Int (A)) $\cup$ Int (C1 (A)) The complement of b - open set is called b - closed set.

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Definition: 1.5 [9] A subset A of a bitopological space (X, τ_1, τ_2) is called $\tau_1\tau_2 - sg\ closed$ if $\tau_2 - scl(A) \subseteq$ U whenever A $\subseteq$ U and U is τ_1-semi open in X.

Definition: 1.6 [12] A subset A of a bitopological space (X, τ_1, τ_2) is called $\tau_1\tau_2 - \omega\ closed$ if $\tau_2 - cl(A) \subseteq$ U whenever A $\subseteq$ U and U is τ_1-semi open in X.

2. Pairwise bg closed and Pairwise * bg closed set

Definition: 2.1 A set A of a bitopological space (X, τ_1, τ_2) is called Pairwise bg closed if $\tau_2 - bcl(A) \subseteq$ U whenever A $\subseteq$ U and U is τ_1-semi open in X.

Definition: 2.2 A set A of a bitopological space (X, τ_1, τ_2) is called Pairwise * bg closed if $\tau_2 - bcl(A) \subseteq$ U whenever A $\subseteq$ U and U is τ_1- α open in X.

Theorem: 2.3

(a) Every Pairwise bg closed set is Pairwise * bg closed set.
(b) Every $\tau_1\tau_2 - \omega$ closed set is Pairwise bg closed set.
(c) Every $\tau_1\tau_2 - \omega$ closed set is Pairwise * bg closed set.
(d) Every $\tau_1\tau_2 -$ sg closed set is Pairwise bg closed set.
(e) Every $\tau_1\tau_2 -$ sg closed set is Pairwise * bg closed set.

Proof: a) Let A be Pairwise bg closed set. We have to prove A is Pairwise * bg closed set. Let A $\subseteq$ U and U is τ_1- α open in X. Since every α open set is semi open set then U is τ_1-semi open in X. Also since A $\subseteq$ U and U is τ_1-semi open in X and A is Pairwise bg closed set, then $\tau_2 - bcl(A) \subseteq$ U. Therefore A is Pairwise * bg closed set.The other results follows from the definitions.

Remark: 2.4 The converse of the above theorems are not true and it is shown by the following examples.

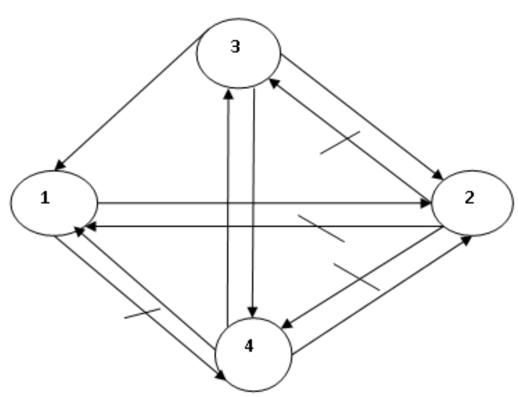
Example: 2.5 Let X = {a, b, c}; $\tau_1 = \{\phi, X, \{a\}, \{c\}, \{a, c\}\}$; $\tau_2 = \{\phi, X, \{a\}, \{a, b\}, \{a, c\}\}$. Here $\{a, b\}$ is Pairwise * bg closed but not Pairwise bg closed set.

Example: 2.6 Let X = {a, b, c}; $\tau_1 = \{\phi, X, \{a\}, \{c\}, \{a, c\}, \{a, b\}\}$; $\tau_2 = \{\phi, X, \{b\}, \{b, c\}\}$. Here $\{c\}$ is Pairwise bg closed but not $\tau_1\tau_2 - \omega$ closed set.

Example: 2.7 Let X = {a, b, c}; $\tau_1 = \{\phi, X, \{c\}, \{b, c\}, \{a, c\}\}$; $\tau_2 = \{\phi, X, \{a\}, \{a, c\}\}$. Here $\{c\}$ is Pairwise * bg closed but not $\tau_1\tau_2 - \omega$ closed set.

Example: 2.8 Let X = {a, b, c}; $\tau_1 = \{\phi, X, \{c\}, \{a, b\}\}$; $\tau_2 = \{\phi, X, \{a\}, \{a, c\}\}$. Here $\{a, c\}$ is Pairwise * bg closed but not $\tau_1\tau_2 -$ sg closed set.

Remark: 2.9 From the above theorems and examples we have the following diagrammatic representation.



Here the numbers 1 to 4 represent the following:

1. Pairwise bg closed set 2. Pairwise $*\ bg$ closed
2. $\tau_1\tau_2 -$ sg closed set 4. $\tau_1\tau_2 - \omega$ closed set

Proposition: 2.10 The finite union of Pairwise bg closed (Pairwise $*bg$ closed) set is Pairwise bg closed (Pairwise * bg closed).

Proof: Let A and B be Pairwise bg closed (Pairwise * bg closed) subsets of X and let U be τ_1- semi open (α open) in X such that $A \cup B \subseteq U$ .Then $\tau_2 - bcl(A) \subseteq U, \tau_2 - bcl(B) \subseteq U$.

Therefore $\tau_2 - bcl(A \cup B) = \tau_2 - bcl(A) \cup \tau_2 - bcl(B) \subseteq U$. This implies $\tau_2 - bcl(A \cup B) \subseteq U$. Hence $A \cup B$ is Pairwise bg closed (Pairwise * bg closed) set.

Theorem: 2.11 If A is an Pairwise bg closed (Pairwise * bg closed) set of (X, τ_1, τ_2) such that $A \subseteq B \subseteq \tau_2 - bcl(A)$ then B is also an Pairwise bg closed (Pairwise * bg closed) set of X.

Proof: Let B $\subseteq$ U where U is τ_1- semi open (α open) in X. Then $A \subseteq B$ implies $A \subseteq U$. Since A is $p$airwise bg closed (Pairwise $*\ bg$ closed) then $\tau_2 - bcl(A) \subseteq U$.

Given $B \subseteq \tau_2 - bcl(A)$ then $\tau_2 - bcl(B) \subseteq \tau_2 - bcl(\tau_2 - bcl(A)) \subseteq \tau_2 - bcl(A) \subseteq U$ .Therefore B is Pairwise bgclosed (Pairwise * bg closed) set.

Proposition: 2.12 If A is Pairwise bg closed (Pairwise $*\ bg$ closed) subset of (X, τ_1, τ_2) then $[\tau_2 - bcl(A)] - A$ does not contain any non empty $\tau_1 -$ semi closed (α closed) sets.

Proof: Let A be Pairwise bg closed (Pairwise $*\ bg$ closed) set. Suppose F$\neq \phi$ is $\tau_1 -$ semi closed (α closed) set of $[\tau_2 - bcl(A)] - A$ then $F \subseteq \tau_2 - bcl(A) - A$. This implies $F \subseteq \tau_2 - bcl(A)$ and $F \subseteq X - A$. Consider $A \subseteq X - F$ then $F \subseteq [\tau_2 - bcl(A]^c$. Therefore, $F \subseteq [\tau_2 - bcl(A)] \cap [\tau_2 - bcl(A)]^c = \phi$. Hence F = ϕ.

Corollary: 2.13 Let A be Pairwise bg closed (Pairwise $*\ bg$ closed) set in (X, τ_1, τ_2) then A is $\tau_2 - b -$ closed iff $[\tau_2 - bcl(A)] - A$ is $\tau_1 -$ semi closed (α closed) set.

Proof: Let A be Pairwise bg closed (Pairwise $*\ bg$ closed) set. If A is $\tau_2 - b -$ closed we have $\tau_2 - bcl(A)$ = A then $[\tau_2 - bcl(A)] - A = \phi$ which is $\tau_1 -$semi closed (α closed) set.
Conversely, let $[\tau_2 - bcl(A)] - A$ is $\tau_1 -$semi closed (α closed) set. Then by proposition 3.3, $[\tau_2 - bcl(A)] - A$ is $\tau_1 -$semi closed (α closed) subset of itself then $[\tau_2 - bcl(A)] - A = \phi$. This implies that $\tau_2 - bcl(A) = A$. Therefore A is $\tau_2 - b -$ closed.

Definition: 2.14 A subset $A \subseteq X$ is called Pairwise bg open (Pairwise $*\ bg$ open) set iff its complement is Pairwise bg closed (Pairwise $*\ bg$ closed) set.

Theorem: 2.15 A subset $A \subseteq X$ is Pairwise bg open (Pairwise $*\ bg$ open) set iff $F \subseteq \tau_2 - bint(A)$ whenever F is semi closed (α closed) in τ_1 such that $F \subseteq A$.

Proof: Necessity: Let A be Pairwise bg open (Pairwise $*\ bg$ open) set and F be semi closed (α closed) in τ_1 such that $F \subseteq A$. Then $X - A$ is contained in $X - F$ where $X - F$ is semi open (α open) in τ_1. Since A is Pairwise bg open (Pairwise $*\ bg$ open),
$\tau_2 - bcl(X - A) \subseteq X - F$. This implies $X - [\tau_2 - bint(A)] \subseteq X - F$. Thus F $\subseteq \tau_2 - bint(A)$.
Sufficiency: Suppose F is semi closed (α closed) in τ_1 and F $\subseteq$ A .This implies F $\subseteq \tau_2 - bint(A)$. Let $X - A \subseteq U$, where U is semi open (α open) set in τ_1.Then $X - U \subseteq A$,where $X - U$ is semi closed (α closed) in τ_1 .By hypothesis, $X - U \subseteq \tau_2 - bint(A)$ (i.e) $X - [\tau_2 - bint(A)] \subseteq$ U. Then $\tau_2 - bcl(X - A) \subseteq U$ implies X – A is Pairwise bg closed (Pairwise $*$ bg closed) set. Therefore A is Pairwise bg open (Pairwise $*\ bg$ open) set.

Theorem: 2.16 If $A \subseteq X$ is Pairwise bg closed (Pairwise $*\ bg$ closed) set then $[\tau_2 - bcl(A)] - A$ is Pairwise bg open (Pairwise $*\ bg$ open).

Proof: Let A be Pairwise bg closed(Pairwise $*\ bg$ closed). Let F be semi closed (α closed) set in τ_1 such that $F \subseteq [\tau_2 - bcl(A)] - A$.Then by proposition 2.13, $F = \phi$. So $F \subseteq [\tau_2 - bint([\tau_2 - bcl(A)] - A)]$. This implies $[\tau_2 - bcl(A)] - A\ is$ Pairwise bg open (Pairwise $*\ bg$ open) set.

3. Pairwise bg and Pairwise $*\ bg$ continuous functions

Definition: 3.1
(i) A function $f: (X, \tau_1, \tau_2) \to (Y, \sigma_1, \sigma_2)$ where (X, τ_1, τ_2) and (Y, σ_1, σ_2) are bitopological space is pairwise bg continuous if $f^{-1}(U)$ is Pairwise bg closed in X for each σ_j closed U in Y,$i \neq j\ and\ i, j = 1,2$

(ii) A function $f: (X, \tau_1, \tau_2) \to (Y, \sigma_1, \sigma_2)$ where (X, τ_1, τ_2) and (Y, σ_1, σ_2) are bitopological space is pairwise * bg continuous if $f^{-1}(U)$ is pairwise * bg closed in X for each σ_j closed U in Y,$i \neq j\ and\ i, j = 1,2$

Theorem: 3.2
(a) Every pairwise bg continuous function is pairwise * bg continuous function.
(b) Every $\tau_1\tau_2 - \omega$ continuous function is pairwise bg continuous function.
(c) Every $\tau_1\tau_2 - \omega$ continuous function is pairwise * bg continuous function.
(d) Every $\tau_1\tau_2 - sg$ continuous function is pairwise bg continuous function.
(e) Every $\tau_1\tau_2 - sg$ continuous function is pairwise * bg continuous function.

Proof: a) Let $f: (X, \tau_1, \tau_2) \to (Y, \sigma_1, \sigma_2)$ be pairwise bg continuous. Let U be σ_j closed set in Y. Then $f^{-1}(U)$ is Pairwise bg closed set in X. Since every Pairwise bg closed set is pairwise * bg closed set in X then $f^{-1}(U)$ is pairwise * bg closed set in X. Hence f is pairwise * bg continuous function. The proof is obvious for others.

Remark: 3.3 The converse of the above theorems are not true as shown by the following examples.

Example: 3.4 Let $X = Y = \{a, b, c\}$; $\tau_1 = \{\phi, X, \{a\}, \{c\}, \{a, c\}\}$; $\tau_2 = \{\phi, X, \{a\}, \{a, b\}, \{a, c\}\}$; $\sigma_1 = \{\phi, Y, \{a, c\}\}$; $\sigma_2 = \{\phi, Y, \{a\}\}$. Let $f: (X, \tau_1, \tau_2) \to (Y, \sigma_1, \sigma_2)$ be a function defined by $f(a) = c$, $f(b) = b$, $f(c) = a$.
Here $f^{-1}(b, c) = \{a, b\}$ is pairwise * bg closed but not pairwise bg closed set. Therefore f is pairwise * bg continuous but not pairwise bg continuous function.

Example: 3.5 Let $X = Y = \{a, b, c\}$; $\tau_1 = \{\phi, X, \{a\}, \{a, c\}, \{c\}, \{a, b\}\}$; $\tau_2 = \{\phi, X, \{b\}, \{b, c\}\}$; $\sigma_1 = \{\phi, Y, \{c\}, \{a, c\}\}$; $\sigma_2 = \{\phi, Y, \{a, b\}\}$. Let $f: (X, \tau_1, \tau_2) \to (Y, \sigma_1, \sigma_2)$ be an identity function.
Here $f^{-1}(c) = \{c\}$ is pairwise bg closed but not $\tau_1\tau_2 - \omega$ closed set. Therefore f is pairwise bg continuous but not $\tau_1\tau_2 - \omega$ continuous function.

Example: 3.6 Let $X = Y = \{a, b, c\}$; $\tau_1 = \{\phi, X, \{c\}, \{b, c\}, \{a, c\}\}$; $\tau_2 = \{\phi, X, \{a\}, \{a, c\}\}$; $\sigma_1 = \{\phi, Y, \{b\}, \{b, c\}\}$; $\sigma_2 = \{\phi, Y, \{a, b\}\}$. Let $f: (X, \tau_1, \tau_2) \to (Y, \sigma_1, \sigma_2)$ be an identity function. Here $f^{-1}(c) = \{c\}$ is pairwise * bg closed but not $\tau_1\tau_2 - \omega$ closed set. Therefore f is pairwise * bg continuous but not $\tau_1\tau_2 - \omega$ continuous function.

Example: 3.7 Let $X = Y = \{a, b, c\}$; $\tau_1 = \{\phi, X, \{c\}, \{a, b\}\}$; $\tau_2 = \{\phi, X, \{a\}, \{a, c\}\}$; $\sigma_1 = \{\phi, Y, \{a\}, \{a, b\}\}$; $\sigma_2 = \{\phi, Y, \{a\}\}$. Let $f: (X, \tau_1, \tau_2) \to (Y, \sigma_1, \sigma_2)$ be a function defined by $f(a) = b$, $f(b) = a$, $f(c) = c$. Here $f^{-1}(b, c) = \{a, c\}$ is pairwise * bg closed but not $\tau_1\tau_2 - sg$ closed set. Therefore f is but not $\tau_1\tau_2 - sg$ continuous function.

Theorem: 3.8 The following are equivalent for a function $f: (X, \tau_1, \tau_2) \to (Y, \sigma_1, \sigma_2)$
(a) f is pairwise bg continuous (pairwise * bg continuous).
(*b*)$f^{-1}(U)$ is pairwise bg open (pairwise $*\ bg$ open) in X for each σ_j − open set U in Y,$i \neq j$ and $i, j = 1,2$.

Proof: (a) $\Rightarrow$ (b) Suppose that f is pairwise bg continuous (pairwise * bg continuous). Let A be σ_j − open set in Y. Then $Y - A$ is σ_j − closed set in Y. Since f is pairwise bg continuous (pairwise * bg continuous), $f^{-1}(Y - A)$ is pairwise bg closed (pairwise $*\ bg$ closed) in X, $i \neq j$ and $i, j = 1,2$.Consequently, $f^{-1}(A)$ is pairwise bg open (pairwise $*\ bg$ open) in X.

(b) $\Rightarrow$ (a) Suppose that $f^{-1}(A)$ is pairwise bg open (pairwise $*bg$ open) in X for each σ_j- open set U in Y, $i \neq j$ and $i,j = 1,2$. Let V be σ_j- closed set in Y.Then $X - V$ is σ_j- open in Y. Then by our assumption, $f^{-1}(X - V)$ is pairwise bg open (pairwise $*bg$ open) in X, $i \neq j$ and $i,j = 1,2$.Then $f^{-1}(V)$ is pairwise bg closed (pairwise $*bg$ closed) in X. Hence f is pairwise bg continuous (pairwise * bg continuous).

Remark: 3.9 The composition of two pairwise bg continuous (pairwise $*bg$ continuous) functions is not pairwise bg continuous (pairwise $*bg$ continuous) functions as shown by the following example.

Example: 3.10 Let $X = Y = Z = \{a,b,c\}$; $\tau_1 = \{\phi, X, \{a,b\}, \{b,c\}, \{b\}\}$; $\tau_2 = \{\phi, X, \{a\}, \{a,c\}, \{a,b\}\}$;
$\sigma_1 = \{\phi, Y, \{b,c\}\}$; $\sigma_2 = \{\phi, Y, \{c\}, \{a,c\}\}$; $\gamma_1 = \{\phi, Z, \{b\}, \{a,c\}\}$; $\gamma_2 = \{\phi, Z, \{b\}, \{b,c\}\}$.

Let $f: (X, \tau_1, \tau_2) \to (Y, \sigma_1, \sigma_2)$ be a function defined by $f(a) = a$, $f(b) = c$, $f(c) = b$. And $g: (Y, \sigma_1, \sigma_2) \to (Z, \gamma_1, \gamma_2)$ be an identity function.Then f *and* g are pairwise bg continuous function. But $f^{-1}(g^{-1}(a)) = \{a\}$ is not pairwise bg closed in (X, τ_1, τ_2). Hence $g\ o\ f$ is not pairwise bg continuous function.

Definition: 3.11 A function $f: (X, \tau_1, \tau_2) \to (Y, \sigma_1, \sigma_2)$ is

- **(a)** pairwise bg irresolute if $f^{-1}(U)$ is $\tau_i\tau_j-$pairwise bg closed for each $\sigma_i\sigma_j-$pairwise bg closed U in Y, $i \neq j$ *and* $i,j = 1,2$.
- **(b)** pairwise * bg irresolute if $f^{-1}(U)$ is $\tau_i\tau_j-$pairwise * bg closed for each $\sigma_i\sigma_j-$ pairwise * bg closed U in Y, $i \neq j$ *and* $i,j = 1,2$.

Proposition: 3.12 If f is pairwise bg irresolute (pairwise * bg irresolute) then f is pairwise bg continuous (pairwise $*bg$ continuous) function.

Proof: Let V be σ_j-closed set in Y. Then V is $\sigma_i\sigma_j-$pairwise bg closed (pairwise * bg closed) in Y. By assumption, $f^{-1}(V)$ is pairwise bg closed (pairwise * bg closed) in X. Hence f is pairwise bg continuous (pairwise $*bg$ continuous) function.

Remark: 3.13 The converse of the above theorem is not true as shown by the following example.

Example: 3.14 Let $X = Y = \{a,b,c\}$; $\tau_1 = \{\phi, X, \{a,c\}\}$; $\tau_2 = \{\phi, X, \{c\}, \{a,c\}\}$; $\sigma_1 = \{\phi, Y, \{b\}, \{a,c\}\}$;
$\sigma_2 = \{\phi, Y, \{a\}, \{a,b\}\}$. Let $f: (X, \tau_1, \tau_2) \to (Y, \sigma_1, \sigma_2)$ be a function defined by $f(a) = a$, $f(b) = c$, $f(c) = b$.

Here $f^{-1}(c) = \{b\}$ and $f^{-1}(b,c) = \{b,c\}$ is pairwise bg closed in (X, τ_1, τ_2). Hence f is pairwise bg continuous. But $f^{-1}(a,b) = \{a,c\}$ is not pairwise bg closed in (X, τ_1, τ_2). Hence it is not pairwise bg irresolute (pairwise * bg irresolute) function.

Theorem: 3.15 Let $f: (X, \tau_1, \tau_2) \to (Y, \sigma_1, \sigma_2)$ and $g: (Y, \sigma_1, \sigma_2) \to (Z, \mu_1, \mu_2)$ be two functions. Then if f and g are pairwise bg irresolute (pairwise *bg irresolute) then $g\ o\ f$ is pairwise bg irresolute (pairwise * bg irresolute) function.

Proof: Let $f: (X, \tau_1, \tau_2) \to (Y, \sigma_1, \sigma_2)$ and $g: (Y, \sigma_1, \sigma_2) \to (Z, \mu_1, \mu_2)$ be pairwise bg irresolute (pairwise * bg irresolute). Let V be pairwise bg closed (pairwise * bg closed) set in Z. Since g is pairwise bg irresolute (pairwise * bg irresolute) function, then $g^{-1}(v)$ is pairwise bg closed (pairwise * bg closed) in Y. Since f is pairwise bg irresolute (pairwise * bg irresolute) function, $(gof)^{-1}(v) = f^{-1}(g^{-1}(v))$ is pairwise bg closed (pairwise * bg closed) in X. Therefore $g\ o\ f$ is pairwise bg irresolute function (pairwise * bg irresolute).

Theorem: 3.16 Let $f: (X, \tau_1, \tau_2) \to (Y, \sigma_1, \sigma_2)$ and $g: (Y, \sigma_1, \sigma_2) \to (Z, \mu_1, \mu_2)$ be two functions. Then if f is pairwise bg irresolute (pairwise * bg irresolute) function and g is pairwise bg continuous (pairwise $*bg$ continuous) function. Then $g\ o\ f$ is pairwise bg continuous (pairwise $*bg$ continuous) function.

Proof: Let $f: (X, \tau_1, \tau_2) \to (Y, \sigma_1, \sigma_2)$ be pairwise bg irresolute (pairwise * bg irresolute) function and $g: (Y, \sigma_1, \sigma_2) \to (Z, \mu_1, \mu_2)$ be pairwise bg continuous (pairwise $*bg$ continuous) function. Let V be σ_j- closed set in Z. Since g is pairwise bg continuous (pairwise $*bg$ continuous) function, then $g^{-1}(v)$ is pairwise bg closed (pairwise * bg closed) in Y.

Since f is pairwise bg irresolute (pairwise * bg irresolute) function, $(gof)^{-1}(v) = f^{-1}(g^{-1}(v))$ is pairwise bg closed (pairwise * bg closed) in X. Therefore $g\ o\ f$ is pairwise bg continuous (pairwise $*bg$ continuous) function.

Theorem: 3.17 Let $f: (X, \tau_1, \tau_2) \to (Y, \sigma_1, \sigma_2)$ and $g: (Y, \sigma_1, \sigma_2) \to (Z, \mu_1, \mu_2)$ be two functions. Then if f is pairwise bg continuous (pairwise $*bg$ continuous) function and g is pairwise continuous. Then $g\ o\ f$ is pairwise bg continuous (pairwise $*bg$ continuous) function.

Proof: Let $f: (X, \tau_1, \tau_2) \to (Y, \sigma_1, \sigma_2)$ be pairwise bg continuous (pairwise $*bg$ continuous) function and $g: (Y, \sigma_1, \sigma_2) \to (Z, \mu_1, \mu_2)$ be pairwise continuous. Let V be $\sigma_j -$ closed set in Z. Since g is pairwise continuous function, then $g^{-1}(v)$ is σ_j closed in Y.Since f is pairwise bg continuous (pairwise $*bg$ continuous) function, $(gof)^{-1}(v) = f^{-1}\left(g^{-1}(v)\right)$ is pairwise bg closed (pairwise * bg closed) in X. Therefore $g\ o\ f$ is pairwise bg continuous (pairwise $*bg$ continuous) function.

REFERENCES

1. A.A Abokhadra and A.A Nasef, On extension of certain concepts from a topological space to bitopological space, *Proc.Math.Phys.soc.Egypt.*, 79 (2003), 91-102.
2. D.Andrijevic, On b-open sets, *Mat.Vesnik.*, 38(1986), 24-32.
3. S.P.Arya and T.M.Nour, Separation axioms for bitopological spaces, *Indian J.PureAppl.Math.*, 19 (1988), 42-50.
4. P.Bhattacharyya and B.K.Lahiri, Semi-generalized closed sets in Topology, *Indian J.Math.*,29 (1987), 376-382.
5. N.Biswas,On characterization of semi continuous function, *Ati. A.ccad. Naz Lincei.Ren. Sci. Fis. Mat. Natur.*, 48 (1970),399-402.
6. M.C Caldas,Semi –generalized continuous maps in topological spaces, *Portugal. Math.*, 52(4) (1995), 399-407
7. K.Chandrasekhara Rao and K.Joseph, Semi star generalized closed sets, *Bulletin of pure and Applied sciences* 19E(No 2) 2000,281-290.
8. K.Chandrasekhara Rao and K.Kannan, Semi star generalized closed sets and Semi star generalized open in sets bitopological spaces, *Varahimir journal of Mathematic,s* 5(2) (2005),473-485.
9. Fathi.H.Khedr and Hanan S.AI-Saadi, On Pairwise semi generalized closed sets, *JKAU*: *Sci*, *21*(2),269-295,(2009).
10. T.Fukutake, On generalized closed sets in bitopological spaces, *Bull.FukuokaUniv.Ed.Part III*, 35 (1986), 19-28.
11. T.Fukutake, Semi-open sets in bitopological spaces, *Bull. FukuokaUniv. Ed.Part III.*, 38 (1989), 1-7.
12. T.Fukutake,P.Sundharam and M.Sheik John, ω closed sets, ω open sets and ω continuity in bitopological spaces, *Bull. FukuokaUniv. Ed.Part III.*, 51,1-9,(2002).
13. M.Jelic, A decomposition of pairwise continuity, *J.Inst.Math. Comp.Sci.*, 3(1990), 25-29.
14. J.C.Kelly, Bitopological spaces, *Proc.London Math. Soc.*, 13(1963) 71-89.
15. N.Levine, Semi-open sets and semi-continuity in topological spaces, *Amer Math*,Monthly., 70(1963), 36-41.
16. A.S.Mashhour, M.E.Abd E1-Monsef and S.N.E1-Deeb, On pre-continuous and weak pre-continuous mappings, *Proc Math and Phys.Soc.Egypt.*, 53 (1982), 47-53.
17. H.Maki, P.Sundaram and K.Balachandran, Semi- generalized continuous maps and semi $T_{1/2}$ spaces, *Bull.Fukuuoka Univ.Ed.part-III.*, 40 (1991), 33-40.
18. H.Maki, P.Sundaram and K.Balachandran, On generalized continuous maps and pasting lemma in bitopological spaces, *Bull.FukokaUniv.Ed.Part III*, 40(1991), 23-21.
19. O.Njastad, On some classes of nearly open sets, *Pacific J.Math.*, (1965), 961-970.
20. C.W.Patty, Bitopological spaces, *DakeMath.J.*, 34 (1967), 387-392.

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