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Forms weakly continuity using weak $\omega-$ open sets

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Abstract

In this paper, we introduced new types of weak continuity by weakly open sets we have named perfectly $\omega-$continuous, contra $-\omega-$continuous and approximately $\omega-$continuous. As well as we created the relationship between them and also provided some theorems about these types of weak continuous.

Subject Classification: *54C05, 54C08, 54C10.*

Keywords: ap $-\omega-$continuous, ap $-\omega-$open, ap $-\omega-$closed, ultra $-\omega-$open map.

1. Introduction

In 1970, Levine [5] presented his notion generalization closed sets (g – closed) in a topological spaceDontcher. J.[2] introduced notion contra continuous map by open set in 1996. Noiri.T, Al-Omari.A. and Noorani. M. S. M. [7] introduced type of the sets are called weak ω – open sets by ω – closedset.

To know more properties about weak ω – open see [7]. In this research, we have circulated ω – closed and ω – open we have name $g\omega$ – closed and $g\omega$ – open respectively, through which we have known a new kind of continuity we have named contra – ω – continuous, perfectly

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$\omega-$ continuous and approximately $\omega-$ continuous we have shown the relationship between them and also presented some theorems about them. We also introduced new types of closed maps and called them approximately $\omega-$ closed map and ultra $-\ \omega-$ closed map, perfectly $-\ \omega-$ closed map, we have proved some of the characteristics that concern them. In addition [1] introduced new types of continuous functions and names of generalizations of continuity. In a year 2013 C.Janaki and V. Jeyanthi introduce and investigate the notion of contra πgr-continuous,almost contra πgr-continuous functions and discussed the relationship with other contra continuous functions and obtained their characteristics [4]. Also Md. Hanif Page [3] StudyAlmost Contra gs-continuous functions. Luay. A. Al Swidi and Mustafaknew the types of continuity usingweak ω – ω – Open Sets

2. Auxiliary Results

Definition 2.1. [7] : Let x be a point x in (X, T). We call x is condensation point of A if for every U in T and x in U, the set $U \cap A$ is uncountable.

Definition 2.2. [7] : Let $A \subseteq X$. If A contains all its condensation points then it is called $\omega-$ closed. The complement of the $\omega-$ closed set is called $\omega-$ open".

Remark 2.3. [7] : It is clear that any open set is $\omega-$ open

Definition 1.4. [7] : Let A be a subset of a space X. A is called"

1. $b-\ \omega-$ open if $A \subseteq \text{int}_\omega(cl(A)) \cup cl(\text{int}_\omega(A))$ and we called $b-\ \omega-$ closed set to the complement of the $b-\ \omega-$ open set .
2. $\beta-\ \omega-$ open if $A \subseteq cl(\text{int}_\omega(cl(A)))$ and we called $\beta-\ \omega-$ closed set to the complement of the $\beta-\ \omega-$ open set .
3. $\alpha-\ \omega-$ open if $A \subseteq \text{int}_\omega(cl(\text{int}_\omega(A)))$ and we called $\alpha-\ \omega-$ closed set to the complement of the $\alpha-\ \omega-$ open set .
4. pre $-\ \omega-$ open if $A \subseteq \text{int}_\omega(cl(A))$ and we called pre $-\ \omega-$ closed set to the complement of the pre $-\ \omega-$ open set.

3. The Main Result

Definition 3.1 : Let $(\mathfrak{R}, \mathcal{T})$ be a topological space. Let $M \subseteq \mathfrak{R}$. We called M a generalized $\omega-$ closed set ($g\omega-$ closed set) if $cl_{\omega}(M) \subseteq S$, whenever $M \subseteq S$ and S is an $\omega-$ open set.

The complement of the generalized $\omega-$ closed set is called generalized $\omega-$ open set ($g\omega-$ open set).

Definition 3.2 : A map $e:(\mathfrak{R}, \mathcal{T}) \to (\mathcal{F}, \mathcal{T}')$ is called to be approximately $\omega-$ continuous (ap $-$ $\omega-$ continuous) map if $cl_{\omega}(G) \subseteq e^{-1}(S)$ whenever S is an $\omega-$ open subset $\mathcal{F}$ and G is $g\omega-$ closed subset of $\mathfrak{R}$, s.t $G \subseteq e^{-1}(S)$.

Let us now recall the definition of the $\omega-$ continuous map.

Definition 3.3 : A function $e:(\mathfrak{R}, \mathcal{T}) \to (\mathcal{F}, \mathcal{T}')$ is called to be $\omega-$ continuos if for any $r \in \mathfrak{R}$ and any $\omega-$ open set D of $\mathcal{F}$ containing $e(r)$, there exists $\omega-$ open set S, s. t $e(S) \subseteq D$.

Definition 3.5 : A map $e:(\mathfrak{R}, \mathcal{T}) \to (\mathcal{F}, \mathcal{T}')$ is called to be contra $-$ $\omega-$ continuous if $e^{-1}(D) \subseteq \mathfrak{R}$ is $\omega-$ closed set for any $\omega-$ open set D in $\mathcal{F}$.

Theorem 3.6 : *Let $e:(\mathfrak{R}, \mathcal{T}) \to (\mathcal{F}, \mathcal{T}')$ be a map. If e is contra $-$ $\omega-$ continuous map, then e is ap $-$ $\omega-$ continuous map.*

Proof : Suppose that $S \subseteq \mathcal{F}$ is an $\omega-$ open set and $G \subseteq \mathfrak{R}$ is $g\omega-$ closed set s. t. $G \subseteq e^{-1}(S)$. Therefore $cl_{\omega}(G) \subseteq cl_{\omega}(e^{-1}(S))$. Since e is contra $-$ $\omega-$ continuous map, we've got $e^{-1}(S)$ is an $\omega-$ closed and hence $cl_{\omega}(G) \subseteq cl_{\omega}(e^{-1}(S)) = e^{-1}(S)$. . Thus e is ap $-$ $\omega-$ continuous map.

Definition 3.7 : A map $e:(\mathfrak{R}, \mathcal{T}) \to (\mathcal{F}, \mathcal{T}')$ is called to be approximately $\omega-$ closed set (ap $-$ $\omega-$ closed set) if $e(G) \subseteq \text{int}_{\omega}(D)$ whenever $D \subseteq \mathcal{F}$ is a $g\omega-$ open set, $G \subseteq \mathfrak{R}$ is $\omega-$ closed ù $-$closed set and $e(G) \subseteq D$.

Definition 3.8 : A map $e:(\mathfrak{R}, \mathcal{T}) \to (\mathcal{F}, \mathcal{T}')$ is said to be approximately $\omega-$ open (ap $-$ $\omega-$ open) if $cl_{\omega}(G) \subseteq e(S)$, whenever S is an $\omega-$ open subset of $\mathcal{R}$, G is a $g\omega-$ closed subset of $\mathcal{F}$ and $G \subseteq e(S)$.

Definition 3.9 : A function $e:(\mathfrak{R}, \mathcal{T}) \to (\mathcal{F}, \mathcal{T}')$ is said to be ultra $-$ $\omega-$ closed if any $M \subseteq \mathfrak{R}$ is $\omega-$ closed set, $e(M)$ is $\omega-$ open set in $\mathcal{F}$.

Definition 3.10 : A function $e:(\mathfrak{R}, \mathcal{T}) \to (\mathcal{F}, \mathcal{T}')$ is said to be ultra $-$ $\omega-$ open if any $M \subseteq \mathfrak{R}$ is $\omega-$ open set, $e(M)$ is $\omega-$ closed set in $\mathcal{F}$.

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