Journal of Computer and Mathematical Sciences, *Vol.8(11), 568-575 November 2017* *ISSN 0976-5727 (Print)*
(An International Research Journal), *www.compmath-journal.org* *ISSN 2319-8133 (Online)*

On Semi α-Regular Weakly Open Sets in Topological Spaces

Basavaraj M. Ittanagi and Mohan V

Department of Mathematics,
Siddaganga Institute of Technology, Tumakuru-03,
Affiliated to VTU, Belagavi, Karnataka state, INDIA.
Department of Mathematics,
Gopalan College of Engineering and Management, Bangalore-48,
Affiliated to VTU, Belagavi, Karnataka state, INDIA.
email: vengatachalam.mohan@gmail.com

(Received on: October 30, Accepted: November 2, 2017)

ABSTRACT

In this research paper, a new class of open sets called semi α- regular weakly open sets (sαrw open set) in topological space are introduced, studied and some of their basic properties have been investigated. We also introduce sαrw-closure, sαrw-interior, sαrw neighbourhood, and sαrw -limit points discuss some of their properties.

2010 Mathematics Classification: 54A05, 54A10.

Keywords: sαrw-closed sets, sαrw–open sets, sαrw-closure, sαrw-interior, sαrw-neighbourhood and sαrw -limit points.

1. INTRODUCTION

Regular open sets and rw-open sets have been introduced and investigated by Stone[11] and Benchalli and Wali[2] respectively. Levine[6], Nagaveni[9], Pushpalatha[10] introduced and investigated semi open sets, generalized closed sets, weakly generalized closed sets respectively. Maki *et al*.[7] introduced and studied generalized α-closed sets and α- generalized closed sets. S. S. Benchalli *et al*.[3], R. S. Wali and P S. Mandalgeri[13] studied wα-closed, αrw closed sets in topological spaces. Basavaraj M. Ittanagi and Mohan V[14] introduced and studied sαrw-closed sets. We introduce and study the sαrw-open sets in topological space and obtain some of their properties. Also we introduce sαrw -interior, sαrw -neighbourhood, sαrw –limits points in topological space.

2. PRELIMINARIES

Throughout this paper X or (X,τ) represents a topological space. For a subset A of a topological space (X, τ), cl(A), int(A), scl(A), αcl(A), spcl(A) and gcl (A) denotes the closure of A, the interior of A, the semi-closure of A, the α-closure of A, the semi pre closure of A and the g-closure of A in X respectively.

Definition 2.1: Let (X, τ) be topological space and A ⊆ X.

The intersection of all semi closed (respectively pre-closed, α-closed and semi-pre closed) subsets of space X containing A is called the Semi closure (respectively pre-closure, α-closure and Semi-pre-closure) of A and is denoted by scl (A) (respectively pcl (A), αcl (A), spcl (A).

Definition 2.2: A subset A of a topological space (X, τ) is called

1) Generalized semi-closed set (briefly gs closed)[1] if scl (A) ⊆ U whenever A ⊆U and U is open in (X, τ).
2) An α-generalized closed set (briefly αg -closed)[7] if αcl(A) ⊆ U whenever A⊆U and U is open in (X, τ).
3) Generalized semi pre regular closed (briefly gspr-closed) set[10] if spcl (A) ⊆ U whenever A⊆ U and U is regular open in (X, τ).
4) Generalized pre regular closed set (briefly gpr-closed)[2] if pcl (A) ⊆ U whenever A ⊆ U and U is regular open in (X, τ).
5) Weakly generalized closed set (briefly, wg-closed)[9] if cl (int (A)) ⊆ U whenever A ⊆ U and U is open in (X, τ).
6) A regular weakly generalized closed set (briefly, rwg-closed)[9] if cl (int (A)) ⊆ U whenever A ⊆ U and U is regular open in (X, τ).
7) α-generalized regular closed (briefly αgr-closed) set[12] if αcl (A) ⊆ U whenever A ⊆ U and U is regular open in (X, τ).
8) Wα-closed set[3] if αcl (A) ⊆ U whenever A⊆ U and U is w-open in (X, τ).
9) Regular w- closed (briefly rw -closed) set[2] if cl (A) ⊆ U whenever A⊆ U and U is regular semi- open in(X, τ).
10) Generalized pre closed (briefly gp closed) set[8] if pcl (A) ⊆ U whenever A⊆ U and U is open in (X, τ).
11) α regular weakly closed(αrw closed)[13] whenever α-cl(A) ⊆ U and U be rw-open in (X, τ).

The compliment of the above mentioned closed sets are their open sets respectively.

3. SEMI α -REGULAR WEAKLY CLOSED SETS IN TOPOLOGICAL SPACES

Definition 3.1[14]: Let A be subset of topological space (X,τ), A defined semi α- regular weakly closed set (sαrw closed set) whenever scl (A) ⊆ U and A ⊆ U where U be αrw -open in X. The family of all semi α- regular weakly closed sets in (X,τ), is denoted by sαrw C(X).

Example 3.2: Let X = {1, 2, 3, 4} and τ= {X, ϕ, {1}, {2, 3}, {1, 2, 3}} be the topology then Sαrw closed sets are X, ϕ, {1}, {4}, {1, 4}, {2, 3}, {2, 4}, {3, 4}, {1, 2, 4}, {1, 3, 4}, {2, 3, 4}

Results 3.3: From[14]
1) Every closed set is sαrw-closed set in X
2) Every α-closed set in X is sαrw-closed set
3) Every regular closed set is sαrw-closed set in X.
4) Every sαrw-closed set is sg-closed (also αgr-closed, gs-closed, gspr closed, rwg-closed, gp-closed, gpr-closed) set in X

4. SEMI α-REGULAR WEAKLY OPEN SETS IN TOPOLOGICAL SPACES

In this section, we define sαrw-open sets in topological spaces and obtain some of their properties.

Definition 4.1: A subset A in (X, τ) is called Semi α-regular weakly open (briefly, sαrw-open) in X if A^c is sαrw-closed in (X, τ). We denote the family of all sαrw-open sets in (X, τ) by SαRWO(X).

Example 4.2: Let X = {1, 2, 3, 4} and τ= {X, ϕ, {1}, {2, 3}, {1, 2, 3}} be the topology then Sαrw open sets are X, ϕ, {1}, {2}, {3}, {1,2}, {1,3}, {1, 4},{2,3},{1, 2, 3}, {2, 3, 4}

Theorem 4.3: For any topological spaces (X, τ) we have the following
(i) Every open (respectively α-open, regular-open) set is sαrw-open.
(ii) Every sαrw-open set is sg–open set.
(iii) Every sαrw-open set is αgr-open (respectively gs-open, gspr-open, wg-open, rwg open, gp-open and gpr-open) set.

Theorem 4.4: A subset of A of a topological space X is sαrw-open iff U ⊆ αint (A), whenever U is αrw-closed and U ⊆ A.

Proof: Assume that A is sαrw-open set in X and U is αrw-closed set of (X, τ) such that U ⊆ A.
Then X-A is a αrw-closed set in (X, τ). Also X - A ⊆ X- U and X - U is sαrw-open set of (X τ). This implies that scl(X - A) ⊆ X - U. But scl (X - A) = X- αint (A).
Thus X-αint (A) ⊆ X- U, so U ⊆ αint (A).

Conversely:

Suppose U ⊆ αint (A) whenever U is αrw-closed and U ⊆ A. To prove that A is sαrw-open set. Let F be αrw-open set of (X, τ) such that X - A ⊆ F. Then X - F ⊆ A. Now X- F is αrw- closed set containing A, So X- F ⊆ αint (A), X – αint (A) ⊆ F but scl(X - A)= X – αint (A) ⊆ F. Thus scl (X- A) ⊆ F that is X- A is sαrw-closed set and hence A is sαrw-open set.

Theorem4.5: If αint (A) ⊆ B ⊆ A and A is sαrw-open set, then B is sαrw-open set.

Proof: Let αint (A) ⊆ B ⊆ A, Thus X- A ⊆ X- B⊆ X-αint(A) , that is X- A ⊆ X - B ⊆ cl(X-A). Since X- A is sαrw-closed set, X - B is sαrw-closed set. Therefore B in sαrw-open set.

Theorem 4.6: If A ⊆ X is sαrw-closed then scl (A) −A is sαrw-open set.

Proof: Let A be sαrw-closed. Let F ⊆ scl (A) − A, where F is αrw-closed.
Therefore F ⊆ αint (αcl(A) −A) and scl(A) −A is sαrw-open set.

Theorem 4.7: A set A is sαrw-open set in (X, τ) if and only if U = X whenever U is αrw-open and αint (A) ∪ (X-A) ⊆ U.

Proof: Suppose that A is sαrw-open set in X. Let U be αrw-open and αint (A) ∪ (X-A) ⊆ U
U^c ⊆ (αint (A) ∪A^c)^c = (αint (A))^c ∩ A that is, U^c ⊆ (αint (A))^c A^c (because A- B = A∩B^c)
Thus U^c ⊆ αcl (A^c)– A^c (because (αint(A))^c = scl (A^c)). Now A^c is also sαrw-closed and
U^c is αrw- closed then it follows U^c = ϕ then U = X.

Conversely: Suppose F is sαrw-closed and F ⊆ A. Then αint (A) ∪ (X-A) ⊆ αint (A) ∪ (X-F). It follows that αint (A) ∪ (X – F) = X

Definition 4.8: For a subset A of (X, τ), sαrw-closure of A is denoted by sαrwcl (A) and defined as sαrwcl (A) = ∩ {G: A⊆ G, G is sαrw–closed in (X, τ)} or ∩ {G: A⊆ G, G ∈ sαrwC(X)}.

Theorem 4.9: If A and B are subsets of space (X, τ) then
(i) sαrwcl (X) = X, sαrwcl(ϕ) = ϕ.
(ii) A ⊆ sαrwcl (A).
(iii) If B is any sαrw-closed set containing A, then sαrwcl (A) ⊆ B.
(iv) If A ⊆B then sαrwcl (A) ⊆sαrwcl (B).
(v) sαrwcl (A) = sαrwcl (αrwcl (A)).

Proof:
i) By definition of sαrw=closure, X is only sαrw-closed set containing X. therefore sαrwcl(X) = Intersection of all the sαrw- closed set containing X =∩{X} =X therefore sαrwcl (X) = X and again by definition of sαrw-closure sαrwcl (ϕ) = Intersection of all sαrw-closed sets containing ϕ = ϕ ∩ any αrw-closed set containing ϕ = ϕ Therefore sαrwcl (ϕ) = ϕ.
ii) By definition of sαrw-closure of A, it is obvious that A ⊆ sαrwcl (A).
iii) Let B be any sαrw-closed set containing A. Since sαrwcl (A) is the intersection of all sαrw-closed set containing A, sαrwcl(A) is contained in every sαrw- closed set containing A. Hence in particularsαrwcl(A) ⊆ B
iv) Let A and B be subsets of (X, τ) such that A ⊆ B by definition sαrw closure, sαrwcl (B) = ∩{F : B ⊆ F ∈ sαrwC(X)}. If B ⊆ F ∈ αRwC(X) , then sαrwcl (B) ⊆ F. since A ⊆ B , A ⊆ B ⊆ F ∈ αRwC(X), we havesαrwcl(A) ⊆ F ,sαrwcl(A) ⊆ ∩{F : B ⊆ F ∈ αRwC(X)} =sαrwcl(B).Therefore sαrwcl(A) ⊆sαrwcl(B).

v) Let A be any subset of X by definition of sαrw-closure, sαrwcl (A) = ∩ {F: A⊆ F ∈ αRwC(X)}.If A ⊆ F ϵ αRwC(X) then sαrwcl(A) ⊆ F ,since F is sαrw-closed set containing sαrwcl(A) by (iii)sαrwcl(αrwcl(A)) ⊆ F. Hence sαrwcl (αrwcl (A)) = ∩ {F: A⊆ F ∈ αRwC(X)} =sαrwcl (A). Therefore sαrwcl (αrwcl (A)) =sαrwcl (A).

Theorem 4.10: If A ⊆ X is sαrw-closed set then sαrwcl (A) =A

Proof: Let A be sαrw-closed subset of X. we know that A ⊆sαrwcl (A). Also A ⊆ A and A is sαrw-closed, sαrwcl (A) ⊆ A. Hence sαrwcl (A) =A.

Theorem 4.11: For an x ∈ X, x ∈ sαrwcl (A) if and if A∩V ≠ ϕ for every sαrw-open set V containing x.

Proof: Let x ∈ sαrwcl (A) .To prove A ∩V ≠ ϕ for every sαrw-open set V containing x by contradiction. Suppose ∃ sαrw-open set V containing x such that A∩V = ϕ then A ⊆ X- V , X-V is sαrw-closed set ,sαrwcl(A) ⊆ X-V This shows that x ∉ sαrwcl(A) which is contradiction . Hence A∩V ≠ ϕ for every sαrw-open set V containing x.

Conversely:
Let A∩ V ≠ ϕ for every sαrw-open set V containing x. To prove x ∉ sαrwcl (A). We prove the result by contradiction. Suppose x ∉ sαrwcl (A) then there exist a sαrw-closed subset F containing A such that x ∉ F. Then x ∈ X-F is sαrw-open. Also (X-F) ∩ A=ϕ which is contradiction. Hence x ∉ sαrwcl (A).

Theorem 4.12: If A is subset of space X then
(i) sαrwcl(A) ⊆ cl(A)
(ii) sαrwcl(A) ⊆ scl(A)

Proof:
(i) Let A be subset of space X by definition of Closure cl (A) = ⊆ ∩ {F: A ⊆ F ∈ C(X)}. If A ⊆ F ∈ C(X) then A⊆ F∈ sαrwC(X) because every closed set is sαrw-closed that is sαrwcl (A) ⊆ F therefore sαrwcl (A) ⊆ ∩ {F: A⊆ F ∈ C(X)} =cl (A). Hence sαrwcl (A) ⊆ cl (A)
(ii) Let A be subset of space X by definition of s-closure scl (A) = ⊆ ∩ {F: A ⊆ F ∈ C(X)}. If A⊆ F∈ C(X) then A⊆ F ∈ sαrwC(X) because every s-closed set is sαrw-closed that is sαrwcl (A) ⊆ F therefore sαrwcl (A) ⊆ ∩ {F: A⊆ F ∈ C(X)} = scl (A) Hence sαrwcl (A) ⊆ scl(A).

Theorem 4.13: If A is subset of space X then gprcl (A) ⊆ sαrwcl (A) where
gprcl (A) = ⊆ ∩ {F: A ⊆ F∈ gprC(X)}.

Proof: Let A be a subset of X by definition of sαrw-closure, sαrwcl (A) = ∩ {F: A ⊆ F ∈ sαrwC(X)}. If A⊆ F ∈ sαrwC(X) then A ⊆ F ∈ gprc(X), because every sαrw-closed is gpr closed that is gprcl(A) ⊆ F therefore gprcl(A) ⊆ ∩{F : A ⊆ F ∈ sαrwC(X)}= sαrwcl(A).
Hence gprcl(A) ⊆ sαrwcl(A)

Definition 4.14: For a subset A of (X,τ),sαrw-interior of A is denoted by sαrwint(A) and defined as sαrwint(A)= {G: G⊆ A and G is sαrw-open in X} or ∪{G: G⊆ A and G ∈ sαrwO(X)} that is sαrwint (A) is the union of all sαrw-open set contained in A.

Theorem 4.15: Let A and B be subset of space X then

i) sαrwint (X) = X , sαrwint (ϕ)=ϕ
ii) sαrwint (A) ⊆ A
iii) If B is any sαrw-open set contained in A, then B ⊆ sαrwint (A)
iv) If A ⊆ B then sαrwint (A) ⊆ sαrwint (B)
v) sαrwint (A) = sαrwint(sαrwint(A))

Proof: i) and ii) by definition of sαrw-interior of A, it is obvious.
iii) Let B be any sαrw-open set s.t B ⊆ A. Let x ∈ B, B is an sαrw-open set contained in A, x is an sαrw-interior of A i.e. x ∈ sαrwint (A). Hence B ⊆ sαrwint (A).
iv), v), similar proof as theorem5.2 and definition of sαrw-interior

Theorem 4.16: If a subset A of X is sαrw-open then sαrwint (A) = A

Proof: Let A be sαrw-open subset of X. We know that sαrwint (A) ⊆ A ----------eqn (1). Also A is sαrw-open set contained in A from Theorem5.14 iii) A ⊆ sαrwint (A) – eqn (2). Hence from eqn (1) and eqn (2) sαrwint (A) = A.

Theorem 4.17: If A is a subset of X then

i) int(A) ⊆ sαrwint(A) .
ii) αint(A) ⊆ sαrwint(A).

Proof:

i) Let A be a subset of a space X. Let x ∈ int(A) => x ∈ ∪{G : G is open , G⊆ A}=> ∃ an open set G such that x ∈ G ⊆ A => an sαrw-open set G s.t. x ∈ G ⊆ A, as every open set is an sαrw-open set in X=> x ∈∪{G: G is sαrw-open set in X}=> x ∈ sαrwint(A).

Thus x ∈ int (A) => x ∈ sαrwint (A). Hence int (A) ⊆ sαrwint (A).

ii) Let A be a subset of a space X. Let x ∈ αint(A) => x ∈ ∪{G: G is α-open , G ⊆ A}=> ∃ an α-open set G such that x ∈ G ⊆ A => ∃ an sαrw-open set G s.t. x ∈ G ⊆ A, as every α-open set is an sαrw-open set in X=> x∈ ∪ {G :G is sαrw-open set in X}=> x∈ sαrwint(A).Thus x∈ α-int(A)=> x∈ sαrwint(A). Hence αint(A) ⊆ sαrwint(A).

Theorem 4.18: If A is subset of X, then sαrwint (A) ⊆ gpr-int (A), where gpr-int(A) is given by gpr-int(A) = {G⊆ X : G is gpr-open , G ⊆ A}

Proof: Let A be a subset of a space X. Let x ∈ sαrwint (A) => x ∈∪ {G:G is sαrw-open, G⊆ A} =>∃ an sαrw-open set G such that x∈G⊆ A, as every sαrw-open set is an gpr-open set in X=> x ∈ ∪ {G : G is gpr-open, G ⊆ A }=> x ∈ gprint(A). Thus x∈ sαrw int (A) => x ∈ gprint (A) Hence sαrwint (A) ⊆ gpr-int (A).

Theorem 4.19: For any subset A of X

(i) X– sαrwint(A) =sαrwcl(X – A)

(ii) X –sαrwcl(A) = sαrwint(X – A)

Proof: If x∈ X - sαrwint(A) , then x is not in sαrwint(A) , i.e. every sαrw-open set G containing x such that G ⊆ A .This implies every sαrw-open set G containing x intersects (X –A) i.e. G ∩(X − A) = ∅. Then x ∈ sαrwcl (X −A). Therefore X-sαrwint (A) ⊆ sαrwcl(X −A)--eqn (1). Let x ⊆sαrwcl(X −A) , then every x ∈sαrw-open set G containing x intersects (X – A) i.e. G ∩(X − A) ≠ ∅, i.e. every sαrw -open set G containing x s.t. G ⊆ A .Then , x is not in sαrwint(A) , i.e. x ∈ X −sαrwint(A) and so sαrwcl(X − A) ⊆ X − sαrwint(A)---eqn(2). Thus X – sαrwint (A) = sαrwcl (X − A)

Definition 4.20: Let (X,τ) be a topological space and Let x ∈ X ,A subset of N of X is said to be sαrw-neighbourhood of x if there exists an sαrw - open set G s.t. x ∈ G ⊆ N .

Definition 4.21:
(i) Let (X, τ) be a topological space and A be a subset of X, A subset of N of X is said to be sαrw-neighbourhood of A if there exists an sαrw -open set G s.t. A ⊆ G ⊆ N.
(ii) The collection of all sαrw-neighbourhood of x ∈ X is called sαrw-neighbourhood system at x and shall be denoted by sαrw -N(x)

Definition 4.22: Let (X,τ) be a topological space and A be a subset of X, then a point x ∈ X is called a sαrw - limit point of A iff every sαrw-neighbourhood of x contains a point of A distinct from x i.e.(N −{x})∩ A ≠ ∅ for each sαrw-neighbourhood N of x. Also equivalently iff, every sαrw -open set G containing x contains a point of A other than x.
The set of all sαrw limit points of the set A is called derived set A and is denoted by sαrwd(A).

Theorem 4.23: Every neighbourhood N of x ∈ X is a sαrw-neighbourhood of X.

Proof: Let N be neighbourhood of point x ∈ X. To prove that N is a sαrw- neighbourhood of x by definition of neighbourhood, ∃ an open set G such that. x ∈ G ⊂ N. Hence N is sαrw neighbourhood of x.

Theorem 4.24: If a subset N of a space X is sαrw-open, then N is a sαrw-nbhd of each of its points.

Proof: Suppose N is sαrw-open. Let x ∈ N. We claim that N is sαrw-nbhd of x. For N is a sαrw-open set such that x∈ N. Since x is an arbitrary point of N, it follows that N is a sαrw-nbhd of each of its points.

Theorem 4.25: Let X be a topological space. If F is a sαrw-closed subset of X, and x∈F^c. Prove that there exists a sαrw-nbhd N of x such that N∩F = φ.

Proof: Let F be sαrw-closed subset of X and x∈F^c. Then F^c is sαrw-open set of X. So F^c contains an sαrw-nbhd of each of its points. Hence there exists a sαrw-nbhd N of x such that N∈F^c. That is N ∩ F = φ.

Theorem 4.26: Let X be a topological space and for each x∈X, Let sαrw-N (x) be the collection of all sαrw-nbhd of x. Then we have the following results.

(i) ∀x ∈ X, sαrw-N (x) ≠ φ.
(ii) N∈sαrw-N (x) ⇒ x ∈ N.
(iii) N∈ sαrw-N (x), M ⊃ N ⇒ M ∈ sαrw-N(x).
(iv) N∈sαrw-N (x) ⇒ there exists M∈ sαrw-N(x) such that M∈N and M∈sαrw-N (y) for every y∈M.

Proof:

(i) Since X is a sαrw-open set, it is a sαrw-nbhd of every x∈X. Hence there exists at least one sαrw-nbhd for each x ∈X. Hence sαrw-N (x) ≠ ϕ for every x∈X .
(ii) If N∈sαrw-N (x), then N is a sαrw-nbhd of x. So by definition of sαrw-nbhd∈ N.
(iii) Let N∈sαrw-N (x) and M∈ N. Then there is a sαrw-open set G such that x∈ G∈ N. Since N∈M, x∈ G ∈M and so M is sαrw-nbhd of x. Hence M∈sαrw-N (x).

If N∈sαrw-N (x), then there exists an sαrw-open set M such that x∈M∈ N. Since M is an sαrw-open set, it is sαrw-nbhd of each of its points. Therefore M∈ sαrw-N (y) for every y∈M.

REFERENCES

1. S. P. Arya and T.M. Nour, Chatcterizations of s-normal spaces, *Indian J. Pure Appl, Math* 21, 717-719 (1990).
2. S. S. Benchalli and R.S Wali on rw- Closed sets is Topological Spaces, *Bull, Malays, Math, Sci, Soc*.30, 99-110 (2007).
3. S. S. Benchalli, P. G. Patil and T. D. Rayanagaudar, wα-Closed sets is Topological Spaces, *The Global. J. Appl. Math. and Math. Sci*, 2, 53-63 (2009).
4. D.E. Cameron, Properties of s-closed spaces, *Prac Amer Math, Soc* 72,581- 586 (1978).
5. Y. Gnanambal, on generalized pre regular closed sets in topological spaces, *Indian J. Pure. Appl. Math*., 28(3), 351- 360 (1997).
6. N. Levine, Semi-open sets and semi continuity in topological spaces, 70, 36- 41 (1963).
7. H. Maki, R. Devi and K. Balachandran, Associated topologies of generalized α- closed sets and α-generalized closed sets, *Mem. Fac. Sci. Kochi Univ. Ser.A. Math*., 15, 51-63 (1994).
8. H. Maki, J.Umehara and T. Noiri, Every Topological space is pre T. *Mem Fac Sci, Kochi Univ, Math*, 17,33-42 (1996).
9. N. Nagaveni, Studies on Generalizations of Homeomorphisms in Topological Spaces, Ph.D. Thesis, Bharathiar University, Coimbatore, (1999).
10. Pushpalatha, Studies on generalizetions of mapping in topological spaces, Ph.D. Thesis, Bharathiar University, Coimbatore, (2000).
11. M. Stone, Application of the theory of Boolean rings to general topology, *Trans. Amer. Math. Soc*.41,374-481 (1937).
12. M.K.R.S. Veerakumar, O, N α- generalized regular closed sets, *Indian J. of Math*, 44(2), (2002).
13. R S Wali and Prabhavati S Mandalgeri, on α regular w-closed set in Topological spaces, *Int J. of Math Archive* (accepted paper and ref no: 5449).
14. V Mohan and Basavaraj M Ittanagi, On semi α- regular weakly closed set in Topological spaces, *Int J. of Math Archive*, 8(7), 197-204 (2017).