On Neutrosophic Supra Regular B - Closed sets in Neutrosophic Supra Topological spaces

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Abstract
Samarandache establish and begin the new opinion of Neutrosophic set from the Intuitionist fuzzy sets. The goal of this paper is to intiate the value between neutrosophic and supra topological spaces called Neutrosophic supra regular b- closed sets and Neutrosophic supra regular b- open sets and in Neutrosophic supra topological spaces. The corresponding Neutrosophic supra topological space formed by the family of these sets is also studied. some theorems and examples of Neutrosophic Supra regular b - closed sets and Neutrosophic supra regular b- open sets are introduced . Characterizations and its properties are discussed in Neutrosophic supra topology.

Keywords: Neutrosophic topological spaces, Neutrosophic supra topological spaces , Neutrosophic supra regular b- closed sets , Neutrosophic supra regular b - open sets .

1. Introduction

In 1965,Zadeh[19] introduced the notion of fuzzy sets. In 1968, Chang[6] was introduced fuzzy topological spaces by using fuzzy sets. In 1986, Atanassov [3] IIintroduced the notion of intuitionistic fuzzy sets, where the degree of membership and degree of non-membership of an element in a set X were discussed . In 1997, Intuitionistic fuzzy topological spaces were introduced by Coker [8]using intuitionistic fuzzy sets. Samarandache [15]defined the Neutrosophic set on three components, namelyTruth(membership),Indeterminacy,Falsehood(non-membership) from the fuzzy sets and intuitionistic fuzzy sets. In 2012, A.A. Salama and Alblowi [15] introduced the concept of Neutrosophic topological spaces by using Neutrosophic sets.Further the basic sets like Neutrosophic regular open set, Neutrosophic semi-open sets, Neutrosophic pre-open set , Neutrosophic α –open sets and Neutrosophic generalised closed sets are introduced in Neutrosophic topological spaces and their properties are studied by various author . In 1983 , A. S Mashour [13] introduced the notion of supra topological spaces and studied S-continuous functions and S^*- Continuous functions. In 1996 , D.Andrijevic [4] introduced the concept of On b-open sets . In 2008, Devi [9] introduced the concept of supra α- open set, Sα- continuous functions respectively. In 2010 O. R. Sayed and Takashi Noiri [17] introduced Supra b-open sets and Supra b- continunity an topological spaces. In 2011 , I.Arockiarani and M.Trinita Pricilla [5] introduced the concept on Supra
generalized b-closed sets.In 2013 [11] K. Krishnaveni & M. Vigneshwaran introduced the concept on bT – closed sets in supra Topological space. In 2015 , L.Chinnapparaj, P.Sathishmohan , V.Rajendran and K.Indirani [7] introduced supra regular generalized star

b – closed sets. In 2016 ,K.LudiJancy and K.Indirani [12] introduced Supra regular generalized star star b-closed sets in supra topological spaces .In this direction, we introduce and analyse a new class of Neutrosophic Supra regular b - closed sets and Neutrosophic supra regular b- open sets and Neutrosophic Supra regular b – interior in Neutrosophic supra topological spaces.

2. Preliminaries

Definition : 2.1 [14]

Let X be a non empty fixed set . A Neutrosophic set [NS for short] A in X is an object having the form $A=\{\langle x, M_A(x), \Sigma_A(x), \Gamma_A(x)\rangle : x \in X\}$ where the functions $M_A(x), \Sigma_A(x), \Gamma_A(x)$ represent the degree of membership , degree of indeterminancy and the degree of non-membership respectively of each element $x \in X$ to the set A.

Definition : 2.2 [14]

Let $A=\{\langle x, M_A, \Sigma_A, \Gamma_A\rangle\}$ be a NS on X, then the complement of the set A [A^C for short] may be defined as three kinds of complements:

(C1) $A=\{\langle x, 1-M_A(x), 1-\Sigma_A(x), 1-\Gamma_A(x)\rangle : x \in X\}$

(C2) $A=\{\langle x, \Gamma_A(x), \Sigma_A(x), M_A(x)\rangle : x \in X\}$

(C3) $A=\{\langle x, \Gamma_A(x), 1-\Sigma_A(x), M_A(x)\rangle : x \in X\}$

Definition : 2.3 [10]

A neutrosophic topology (NT) on a nonempty set X is a family T_η of neutrosophic sets in X satisfying the following axioms:

$(i)\ 0_\eta, 1_\eta \in T_\eta$

$(ii)\ P_1 \cap P_2 \in T_\eta \quad for\ any\ P_1, P_2 \in T_\eta$

$(iii) \cup P_i \in T_\eta \quad for\ every \{P_i : i \in I\} \subseteq T_\eta$

In this case the ordered pair (x, T_η) or simply X is called a neutrosophic topological space (briefly NTS) and each neutrosophic set in T_η is called a neutrosophic open set (briefly NOS). The complement A of a NOS A in X is called a neutrosophic closed set (briefly NCS) in X. Each neutrosophic supra set (briefly, NSS) which belongs to (x, T_η) is called a neutrosophic supra open set (briefly, NSOS) in X. The complement A of a NSOS A in X is called a neutrosophic supra closed set (briefly NSCS) in X.

Definition : 2.4 [17]

Let (x, T_η) be a neutrosophic supra topological space. A set A is called a neutrosophic supra b – open set if $A \subseteq \eta\hat{S}cl(\eta\hat{S}\operatorname{int}(A)) \cup \eta\hat{S}\operatorname{int}(\eta\hat{S}cl(A))$. The complement of a neutrosophic supra b-open set is called a neutrosophic supra b - closed set.

Definition : 2.5 [5]

Let (x, T_η) be a supra topological space . A set A of X is called supra generalized b – closed set $(\eta\hat{S}gb - closed)$ if $\eta\hat{S}bcl(A) \subseteq \ddot{U}$ whenever $A \subseteq \ddot{U}$ and $\ddot{U}$ is supra open . The complement of supra generalized b – closed set is supra generalized b – open set.

Definition : 2.6 [10]

A subset of (x,T_η) is called a neutrosophic supra regular open if $A=\eta\hat{S}\operatorname{int}(\eta\hat{S}cl(A))$ .If neutrosophic supra regular closed set is $A=\eta\hat{S}cl(\eta\hat{S}\operatorname{int}(A))$.

Definition : 2.7[9]

Let (x,T_η) be a neutrosophic supra topological space. A Subset A of X is called neutrosophic Supra α generalised-closed set $(\eta\hat{S}\alpha g-closed)$. If $\eta\hat{S}\alpha cl(A)\subseteq\ddot{U}$,whenever $A\subseteq\ddot{U}$ and $\ddot{U}$ is neutrosophic supra open set of X.

Definition : 2.8 [12]

Let (x,T_η) be a neutrosophic supra topological space. A Subset A of X is called $(\eta\hat{S}rg-closed)$. If $\eta\hat{S}cl(A)\subseteq\ddot{U}$,whenever $A\subseteq\ddot{U}$ and $\ddot{U}$ is neutrosophic supra regular open in X.

Definition : 2.9[17]

Let (x,T_η) be a neutrosophic supra topological space. A Subset A of X is called $(\eta\hat{S}gr-closed)$.If $\eta\hat{S}rcl(A)\subseteq\ddot{U}$,whenever $A\subseteq\ddot{U}$ and $\ddot{U}$ is neutrosophic supra open in X.

Definition : 2.10[5]

Let (x,T_η) be a neutrosophic supra topological space.A Subset A of X is called $(\eta\hat{S}gb-closed)$. If $\eta\hat{S}bcl(A)\subseteq\ddot{U}$,whenever $A\subseteq\ddot{U}$ and $\ddot{U}$ is neutrosophic supra open in X.

3. Neutrosophic Supra Regular b - Closed Sets

Definition :3.1

A subset A of a Neutrosophic supra topological space $(x,T_\eta)$is called Neutrosophic Supra regular b – closed $(\eta\hat{S}r_b-closed)$ if $\eta\hat{S}rcl(A)\subseteq\ddot{U}$ whenever $A\subseteq\ddot{U}$ and $\ddot{U}$ is Neutrosophic supra b - open in X.

Theorem : 3.2 : Every Neutrosophic supra regular closed set is $\eta\hat{S}r_b$ - closed set but not conversely.

Proof : Let $A\subseteq\ddot{U}$ and $\ddot{U}$ is Neutrosophic supra b – open set in X . Since A is Neutrosophic supra regular closed set , $\eta\hat{S}cl(\eta\hat{S}\operatorname{int}(A))=A$.We know that $\eta\hat{S}rcl(A)\subseteq\eta\hat{S}cl(\eta\hat{S}\operatorname{int}(A))\subseteq\ddot{U}$,implies $\eta\hat{S}rcl(A)\subseteq\ddot{U}$. Therefore A is $\eta\hat{S}r_b$ - closed set.

The converse of the above theorem need not be true as seen from the following examples.

Example : 3.3 . Let X = { a, b } Define the neutrosophic sets P and Q in X as follows :

P = < x , (a , b) (0.3 , 0.3) , (a , b) (0.2,0.2), (a , b) (0.5 , 0.5) > ,

Q = < x , (a , b) (0.7 , 0.6), (a, b) (0.2 , 0.2) , (a, b) (0.5 , 0.5) > .

We have $T_\eta=\{o_\eta,1_\eta,P,Q\}$.

Let R = < x, (a, 0.7,0.6,0.5) , (b, 0.6 , 0.2 , 0.5) > .

Here R is Neutrosophic supra regular b-closed set but not Neutrosophic supra regular closed set.

Theorem : 3.4 : Every $\eta\hat{S}r_b$ -closed set is a $\eta\hat{S}rg$ – closed set .

Proof : **:** Let $A\subseteq\ddot{U}$ and $\ddot{U}$ is Neutrosophic supra regular open in X . We know that every Neutrosophic supra regular open set is Neutrosophic supra b -open set ,then $\ddot{U}$ is Neutrosophic supra b -open set . Since A is $\eta\hat{S}r_b$ - closed set ,We have $\eta\hat{S}cl(A)\subseteq\eta\hat{S}rcl(A)\subseteq\ddot{U}$. Therefore A is $\eta\hat{S}rg$ - closed set .

The converse of the above theorem need not be true from the following examples.
Example : 3.5 . Let X = { a, b,c } Define the neutrosophic sets P and Q in X as follows :
P = < x , (a , b ,c) (0.3 , 0.5, 0.6) , (a , b, c) (0.1,0.2 ,0.6), (a , b , c) (0.3 , 0.7 , 0.4) > ,
Q = < x , (a , b , c) (0.4 , 0.5 , 0.5), (a, b ,c) (0.3 , 0.2 ,0.4) , (a, b , c) (0.4 , 0.5 , 0.3) >.
We have $T_\eta = \{o_\eta, 1_\eta, P, Q\}$.
Let R = < x, (a, 0.4,0.3,0.4) , (b,0.5 , 0.2 , 0.5) ,(c ,0.5, 0.4 , 0.3) > .
Here R is $\eta\hat{S}rg$ – closed set but not $\eta\hat{S}r_b$ -closed set.

Theorem : 3.4 : Every $\eta\hat{S}r_b$ -closed set is a $\eta\hat{S}gr$ – closed set .

Proof : Let $A \subseteq \ddot{U}$ and $\ddot{U}$ is Neutrosophic supra open in X. We know that every Neutrosophic supra open set is Neutrosophic supra b -open set , then $\ddot{U}$ is Neutrosophic supra b -open set .Since A is $\eta\hat{S}r_b$ -closed set ,We have $\eta\hat{S}rcl(A) \subseteq \ddot{U}$. Hence A is $\eta\hat{S}gr$ - closed set .
The converse of the above need not be true as seen from the following examples.
Example :3.7.. Let X = { a, b } Define the neutrosophic sets P and Q in X as follows :
P = < x , (a , b) (0.3 , 0.3) , (a , b) (0.2,0.2), (a , b) (0.5 , 0.5) > ,
Q = < x , (a , b) (0.7 , 0.6), (a, b) (0.2 , 0.2) , (a, b) (0.5 , 0.5) > .
We have $T_\eta = \{o_\eta, 1_\eta, P, Q\}$ .Let R = < x, (a, 0.7,0.6,0.5) , (b, 0.6 , 0.2 , 0.5) > .
Here R is $\eta\hat{S}gr$ - closed set set but not $\eta\hat{S}r_b$ - closed set.

Theorem : 3.8 : Every $\eta\hat{S}r_b$ -closed set is a $\eta\hat{S}gb$ - closed set .

Proof : Let $A \subseteq \ddot{U}$ and $\ddot{U}$ is Neutrosophic supra open in X. We know that every Neutrosophic supra open set is Neutrosophic supra b -open set , then $\ddot{U}$ is Neutrosophic supra b -open set . Since A is $\eta\hat{S}r_b$ -closed set ,We have $\eta\hat{S}bcl(A) \subseteq \eta\hat{S}rcl(A) \subseteq \ddot{U}$. Hence A is $\eta\hat{S}gb$ – closed set .
The converse of the above theorem need not be true from the following examples.
Example :3.9. . Let X = { a, b } Define the neutrosophic sets P and Q in X as follows :
P = < x , (a , b) (0.3 , 0.3) , (a , b) (0.2,0.2), (a , b) (0.5 , 0.5) > ,
Q = < x , (a , b) (0.7 , 0.6), (a, b) (0.2 , 0.2) , (a, b) (0.5 , 0.5) > .
We have $T_\eta = \{o_\eta, 1_\eta, P, Q\}$.
Let R = < x, (a, 0.7,0.6,0.5) , (b,0.6 , 0.2 , 0.5) > .
Here R is $\eta\hat{S}gb$ - closed set but not $\eta\hat{S}r_b$ - closed set.

Theorem : 3.12. The Union of two Neutrosophic supra regular b – closed set is a Neutrosophic supra regular b – closed sets.

Proof : Let A and B be two Neutrosophic supra regular b – closed sets .Let $A \cup B \subseteq \ddot{U}$ where $\ddot{U}$ is $\eta\hat{S}b$ – open. Since A and B are $\eta\hat{S}r_b$ -closed sets . Therefore $\eta\hat{S}rcl(A) \subseteq \eta\hat{S}rcl(B) \subseteq \ddot{U}$ and thus $\eta\hat{S}rcl(A \cup B) \subseteq \ddot{U}$ .Hence $A \cup B$ is $\eta\hat{S}r_b$ -closed sets.

Theorem : 3.14. A set A is $\eta\hat{S}r_b$ -closed and $A \subseteq B \subseteq \eta\hat{S}rcl(A)$ then B is $\eta\hat{S}r_b$ -closed set .

Proof : Let $\ddot{U}$ be Neutrosophic supra b –open set in (x,T_η) such that $B \subseteq \ddot{U}$ .since $A \subseteq B \Rightarrow A \subseteq \ddot{U}$ and since A is $\eta\hat{S}r_b$ -closed set in (x,T_η) $\eta\hat{S}rcl(A) \subseteq \ddot{U}$,since $B \subseteq \eta\hat{S}rcl(A)$.Then $\eta\hat{S}rcl(B) \subseteq \ddot{U}$. Therefore B is also $\eta\hat{S}r_b$ -closed set in (x,T_η).

Theorem : 3.15. If $A \subseteq Y \subseteq X$ and suppose that A is $\eta\hat{S}r_b$ -closed set in X ,

then A is $\eta\hat{S}r_b$ -closed set relative to Y.

Proof : Given that $A \subseteq Y \subseteq X$ and A is $\eta\hat{S}r_b$ -closed set in X .To prove that A is a $\eta\hat{S}r_b$ -closed set relative to Y. Let us assume that $A \subseteq Y \cap C$, where C is Neutrosophic supra b – open in X . Since A is a $\eta\hat{S}r_b$ -closed set , $A \subseteq \ddot{U}$ implies $\eta\hat{S}rcl(A) \subseteq \ddot{U}$, $Y \cap \eta\hat{S}rcl(A) \subseteq Y \cap C$, (i.e) A is a $\eta\hat{S}r_b$ -closed set relative to Y .

4. Neutrosophic Supra Regular b - open sets

Definition : 4.1 A set A of a Neutrosophic supra topological spaces (x,T_η) is called supra regular b – open $(\eta\hat{S}r_b - open)$ if and only if A^c is $\eta\hat{S}r_b$ -closed in X .

Theorem : 4.2 . A subset A of a Neutrosophic supra topological space (x,T_η) is $\eta\hat{S}r_b - open$ if and only if $F \subseteq \eta\hat{S}b\,\mathrm{int}(A)$ whenever $F \subseteq A$ and F is Neutrosophic supra b – closed in X .

Proof : Suppose that $\eta\hat{S}r_b - open$. Let $F \subseteq A$ and F be Neutrosophic supra b – closed . Then $A^c \subseteq F^c$ and F^c is Neutrosophic supra b – open . Since A is $\eta\hat{S}r_b - open$, A^c is $\eta\hat{S}r_b - open$. Hence $\eta\hat{S}rcl(A) \subseteq F^c$. Since $\eta\hat{S}rcl(A^c) = [\eta\hat{S}r\,\mathrm{int}(A)]^c$. Hence $F \subseteq \eta\hat{S}r\,\mathrm{int}(A)$.

Conversely , suppose that $F \subseteq \eta\hat{S}b\,\mathrm{int}(A)$ whenever $F \subseteq A$ and F is Neutrosophic supra b-closed in X . Let $\ddot{U}$ be Neutrosophic supra b-open in X and $A^c \subseteq \ddot{U}$ .Then $\ddot{U}^c$ is supra b – closed and $\ddot{U}^c \subseteq A$. Hence by assumption $\ddot{U}^c \subseteq \eta\hat{S}r\,\mathrm{int}(A)$ therefore $[\eta\hat{S}r\,\mathrm{int}(A)]^c \subseteq \ddot{U}$ (i.e) $\eta\hat{S}rcl(A) \subseteq \ddot{U}$. Therefore A^c is $\eta\hat{S}r_b$ -closed. Hence A is $\eta\hat{S}r_b - open$.

Theorem : 4.3. Let (x,T_η) be Neutrosophic supra topological space . A set A is Neutrosophic supra regular b – open in X if and only if G = X whenever G is Neutrosophic supra b –open and $\eta\hat{S}rcl(A) \cup A^c \subseteq G$.

Proof : Let A be Neutrosophic supra regular b – open ,G be Neutrosophic supra b – open and $\eta\hat{S}rcl(A) \cup A^c \subseteq G$ .Given $G \subseteq (\eta\hat{S}rcl(A)) \cap A^c / A^c$ .Since $A^c$is Neutrosophic supra regular b – closed and G^c is Neutrosophic supra b – closed by theorem 4.2., it follows that $G^c = \phi$ therefore X = G.

Conversely , suppose that F is Neutrosophic supra b- closed and $F \subseteq A$. Then $\eta\hat{S}r\,\mathrm{int}(A) \cup A^c \subseteq \eta\hat{S}r\,\mathrm{int}(A) \cup F^c$. It follows that $\eta\hat{S}r\,\mathrm{int}(A) \cup F = X$ and hence $F \subseteq \eta\hat{S}r\,\mathrm{int}(A)$. Therefore A is Neutrosophic supra regulat b –open .

Proposition 4.4. Let (x,T_η) be Neutrosophic supra topological space if $\eta\hat{S}r\,\mathrm{int}(A) \subseteq B \subseteq A$ and A is Neutrosophic supra regular b – open in X , then B is Neutrosophic supra regular b – open.

Proof : Suppose $\eta\hat{S}r\,\mathrm{int}(A) \subseteq B \subseteq A$ and Neutrosophic supra regular b – closed by theorem 3.10., B is Neutrosophic supra regular b – open in X .

Theorem : 4.5. Let (x, T_η) be Neutrosophic supra topological space . A set A is Neutrosophic supra regular b – closed set. Iff $\eta\hat{S}rcl(A) - A$ is Neutrosophic supra regular b –open in X.

Proof : Necessity : Suppose that A is Neutrosophic supra regular b – closed in X .Let $F \subseteq \eta\hat{S}rcl(A) - A$ where F is Neutrosophic supra b – closed ,by theorem 3.3., $F \neq \phi$. Therefore $F \subseteq \eta\hat{S}r\,\mathrm{int}(\eta\hat{S}rcl(A)) - A$ and by theorem 3.3 ., $\eta\hat{S}rcl(A) - A$ is Neutrosophic supra regular b – open .

Sufficiency : Let $A \subseteq \ddot{U}$ and $\ddot{U}$ be Neutrosophic supra b–open set then $\eta\hat{S}rcl(A) \cap \ddot{U}^c \subseteq \eta\hat{S}rcl(A) \cap A^c = \eta\hat{S}rcl(A) - A$. Since $\eta\hat{S}rcl(A) \cap \ddot{U}^c$ is Neutrosophic supra b – closed set and $\eta\hat{S}rcl(A) - A$ is Neutrosophic supra regular b – open , by theorem 4.2 ., we have $\eta\hat{S}rcl(A) \cap \ddot{U}^c \subseteq \eta\hat{S}r\,\mathrm{int}(rcl(A)) - A^c = \phi$, This show that $\eta\hat{S}rcl(A) \subseteq \ddot{U}$. Hence A is supra regular b – closed set .

5. CONCLUSION

In this paper ,we found a new class of Neutrosophic Supra regular b– open and closed sets in Neutrosophic Supra Topological spaces .Some of their features are also investigated in terms of Neutrosophic Supra topological spaces.

REFERENCES

1. Abd El-Monsef, M. E., & Ramadan, A. E.. On fuzzy supra topological spaces, Indian Journal of Pure and Applied Mathematics, 18(4), (1987), 322-329.
2. Atanassov, K. (1983, June) Intuitionistic fuzzy sets, in: V. Sgurev, Ed., VII ITKR's Session, Sofia (Central Sci. and Techn. Library, Bulg. Academy of Sciences, 1984).
3. Atanassov, K. ,Intuitionistic fuzzy sets. Fuzzy Sets and Systems , 20, (1986),87-96.
4. Andrijevi ,D., On b – Open sets , Mat . Vesnik 48 (1996) , no 1-2 , 59 – 64.
5. Arockiarani .Iand Trinita Pricilla. M., On Supra generalized b – closed sets , Antartica Journal of Mathematics Vol 8 (2011).
6. Chang, C. L. Fuzzy topological spaces. Journal of mathematical Analysis and Applications, 24, (1968),182-190.
7. Chinnapparaj .L.,Sathishmohan .P.,Rajendran .V., and Indirani .K ,On Supra regular generalized star b – closed sets, IOSR Journal of Mathematics ,(2015) , 44 – 48 .
8. Coker, D. (1997). An introduction to intuitionistic fuzzy topological spaces. Fuzzy sets and systems, 88, 81-89.
9. Devi.R. , Sampathkumar.S. and Caldas .M , On Supra α open set and S α – Continous functions, General Mathematics, 16 (2) (2008), 77–84.
10. Dhavaseelan, R., and S. Jafari, S. Generalized Neutrosophic closed sets. Submitted.
11. Krishnaveni. K., and Vigneshwaran.M , On bT-Closed Sets in Supra Topological Spaces,International Journal of Mathematical Archive-4(2), (2013), 260-265.
12. Ludi Jancy Jenifer .K.,Indirani .K., On supra regular generalized star star b-closed sets in supra topological spaces,International Journal of Applied research 2(9) (2016), 748 – 755.

13. Mashhour . A.S. , Allam .A.A., Mohamoud .F.S., and Khedr .F.H. , On Supra Topological spaces, Indian J.Pure and Appl .Math .no 4,14 (1983) 502 – 510.
14. Narmadha .A. , N.Nagaveni ., T.Noiri, On Regular b – open sets in Topological spaces , Int.Journal of Math . Analysis, Vol.7, (2013), no.19, 937 – 948.
15. Salama, A. A. and Alblowi, S. A. (2012). Neutrosophic Set and Neutrosophic Topological Spaces. IOSR Journal of Mathematics, 3(4), 31-35.
16. Smarandache, F. Neutrosophy and Neutrosophic Logic , First International Conference on Neutrosophy , Neutrosophic Logic, Set, Probability, and Statistics University of New Mexico, Gallup, NM 87301, . (2002), USA.
17. Sayed.O.R. and Takashi Noiri., On Supra b – open set and Supra b – continuity on Topological spaces, European Journal of Pure and applied Mathematics , 3(2) (2010), 295 – 302.
18. Turanl, N. n Intuitionistic Fuzzy Supratopological Spaces. International Conference on Modeling and Simulation, Spain, 2, (1999). ,69-77.
19. Muthuvel . S.,Parimelazhagam , b^* -Closed sets in Topological Spaces , International Journal of Mathematical Analysis , Vol 6,(2012) ,no. 46, 2317 – 2323.
20. Vadivel .A.and Vairamanickam .k., $rg\alpha$-Interior and $rg\alpha$-Closure in Topological Spaces,Int.Journal of Math.Analysis, Vol.4,(2010),no.9,435-444.
21. Zadeh, L. A.. Fuzzy sets. Information and Control, 8, (1965),338-353.