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Soft g*-Closed Sets in Soft Minimal Spaces

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Abstract: *In this paper, we define soft g*-closed and soft g*-open sets in soft minimal spaces which are defined over an initial universe with a fixed set of parameters. Further, we discuss basic properties of their sets.*

Keywords: *soft sets, soft minimal space, sg*$\tilde{m}$-closed sets, sg*$\tilde{m}$-open sets.*

AMS Subject Classification: 54A10, 54C08

1. Introduction:

The concept of soft set theory as a new mathematical tool was initiated by Molodtsov [9]. M. Shabir and M. Naz [13] introduced soft topological spaces and the notions of soft closed sets, soft open sets, soft closure, soft interior and soft neighborhood of a point. Levine [8] initiated the study of generalized closed and open sets in topological spaces. Noiri [11] introduced the notion of generalized m-closed (briefly gm-closed) sets and tried to unify certain types of modifications of g-closed sets. Boonpok [1] introduced biminimal structure spaces and studied $m^1{}_X m^2{}_X$–closed and $m^1{}_X m^2{}_X$-open sets in biminimal structure spaces. Recently, in 2015, Gowri and Vembu [4] introduced and studied soft minimal and soft biminimal spaces.

In this present study, we discuss soft g*-closed and soft g*-open sets in soft minimal spaces and obtain the basic results and properties.

2. Preliminaries:

Definition 2.1 [9]: Let U be an initial universe and E is a set of parameters. Let P (U) denotes the power set of U and A is a nonempty subset of E. A pair (F, A) is called a soft set over U, where F is a mapping given by F: A$\longrightarrow$ P (U).

In other words, a soft set over U is a parameterized family of subsets of the universe U. For $\varepsilon \in$A. F (ε) may be considered as the set of ε- approximate elements of the soft set (F, A).

Definition 2.2 [4]: Let X be an initial universe set, E be the set of parameters and A be the soft subset of E (A $\tilde{\subseteq}$ E).Let F_A be a nonempty soft set over X and $\tilde{p}$ (F_A) is the soft

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power set of F_A. A subfamily $\widetilde{m}$ of $\widetilde{p}$ (F_A) is called a soft minimal over X if $F\Phi \in \widetilde{m}$ and $F_A \in \widetilde{m}$.

(F_A, $\widetilde{m}$) or (X, $\widetilde{m}$, E) is called a soft minimal space over X. Each member of $\widetilde{m}$ is said to be $\widetilde{m}$ - soft open set and the complement of a $\widetilde{m}$- soft open set is said to be $\widetilde{m}$ - soft closed set over X.

Example 2.3:

Let U = $\{u_1, u_2\}$, E = $\{x_1, x_2, x_3\}$, A = $\{x_1, x_2\} \widetilde{\subseteq}$ E and

$F_A = \{(x_1\{u_1, u_2\}), (x_2\{u_1, u_2\})\}$. Then

$F_{A1} = \{(x_1\{u_1\})\}$, $F_{A2} = \{(x_1\{u_2\})\}$, $F_{A3} = \{(x_1\{u_1, u_2\})\}$,

$F_{A4} = \{(x_2\{u_1\})\}$, $F_{A5} = \{(x_2\{u_2\})\}$, $F_{A6} = \{(x_2\{u_1, u_2\})\}$,

$F_{A7} = \{(x_1\{u_1\}), (x_2\{u_1\})\}$, $F_{A8} = \{(x_1\{u_1\}), (x_2\{u_2\})\}$

$F_{A9} = \{(x_1\{u_1\}), (x_2\{u_1, u_2\})\}$, $F_{A10} = \{(x_1\{u_2\}), (x_2\{u_1\})\}$

$F_{A11} = \{(x_1\{u_2\}), (x_2\{u_2\})\}$, $F_{A12} = \{(x_1\{u_2\}), (x_2\{u_1, u_2\})\}$

$F_{A13} = \{(x_1\{u_1, u_2\}), (x_2\{u_1\})\}$, $F_{A14} = \{(x_1\{u_1, u2\}), (x_2\{u_2\})\}$

$F_{A15} = F_A$, $F_{A16} = F\Phi$ are all soft subset of F_A,

Soft minimal ($\widetilde{m}$) = $\{F\Phi, F_{A1}, F_{A3}, F_{A7}, F_{A11}, F_{A13}, F_A\}$.

Definition 2.4 [4]: Let (F_A,$\widetilde{m}$) be a soft minimal space with nonempty soft set F_A is said to have property B if the union of any family of soft subsets belonging to $\widetilde{m}$ belongs to $\widetilde{m}$

Definition 2.5 [4]: Let (F_A,$\widetilde{m}$) be a soft minimal space over X. For a soft subset F_B of F_A the $\widetilde{m}$ -soft closure of F_B and $\widetilde{m}$-soft interior of F_B are defined as follows:

(1) $\widetilde{m}Cl\,(F_B) = \cap \{F\alpha : F_B \widetilde{\subseteq} F\alpha, F_A - F\alpha \in \widetilde{m}\}$,

(2) $\widetilde{m}Int\,(F_B) = \cup \{F\beta : F\beta \widetilde{\subseteq} F_B, F\beta \in \widetilde{m}\}$.

Lemma 2.6 [4]:

Let (F_A,$\widetilde{m}$) be a soft minimal space over X. For a soft subset F_B and F_C of F_A, the following properties hold:

(1) $\widetilde{m}Cl\,(F_A - F_B) = F_A - \widetilde{m}Int\,(F_B)$ and $\widetilde{m}Int\,(F_A - F_B) = F_A - \widetilde{m}Cl\,(F_B)$,

(2) If $(F_A - F_B) \in \widetilde{m}$, then $\widetilde{m}Cl\,(F_B) = F_B$ and if $F_B \in \widetilde{m}$, then $\widetilde{m}Int\,(F_B) = F_B$,

(3) $\widetilde{m}Cl\,(F\Phi) = F\Phi$, $\widetilde{m}Cl\,(F_A) = F_A$, $\widetilde{m}Int\,(F\Phi) = F\Phi$ and $\widetilde{m}Int\,(F_A) = F_A$,

(4) If $F_B \widetilde{\subseteq} F_C$ then $\widetilde{m}Cl\,(F_B) \widetilde{\subseteq} \widetilde{m}Cl\,(F_C)$ and $\widetilde{m}Int\,(F_B) \widetilde{\subseteq} \widetilde{m}Cl\,(F_C)$,

(5) $F_B \widetilde{\subseteq} \widetilde{m}Cl\,(F_B)$ and $\widetilde{m}Int\,(F_B) \widetilde{\subseteq} F_B$,

(6) $\widetilde{m}Cl\,(\widetilde{m}Cl\,(F_B)) = \widetilde{m}Cl\,(F_B)$ and $\widetilde{m}Int\,(\widetilde{m}Int\,(F_B)) = \widetilde{m}Int\,(F_B)$.

Lemma 2.7 [4]: Let F_A be a nonempty soft set with a soft minimal $\tilde{m}$ on F_A satisfying property B. For a soft subset F_B of F_A the following properties hold:

(1) $F_B \in \tilde{m}$ if and only if $\tilde{m}$Int $(F_B) = F_B$

(2) If F_B is soft $\tilde{m}$-closed if and only if $\tilde{m}$Cl $(F_B) = F_B$

(3) $\tilde{m}$Int $(F_B) \in \tilde{m}$ and $\tilde{m}$Cl (F_B) is soft $\tilde{m}$-closed.

Definition 2.8 [5]: A soft subset F_B of a soft minimal space $(F_A,\tilde{m})$ is said to be soft generalized $\tilde{m}$-closed (briefly sg$\tilde{m}$-closed) if $\tilde{m}$Cl $(F_B) \tilde{\subseteq} U_B$ whenever $F_B \tilde{\subseteq} U_B$ and U_B is soft $\tilde{m}$-open. The complement of soft generalized $\tilde{m}$-closed set is said to be soft generalized $\tilde{m}$open (briefly sg$\tilde{m}$-open)

3. Soft g*-closed sets in soft minimal space

Definition 3.1: A soft subset F_B of a soft minimal space $(F_A,\tilde{m})$ is said to be soft g*$\tilde{m}$-closed set (briefly sg*$\tilde{m}$-closed set) if $\tilde{m}$Cl $(F_B) \tilde{\subseteq} U_B$ whenever $F_B \tilde{\subseteq} U_B$ and U_B is sg$\tilde{m}$-open.

Example 3.2: Let us consider the soft subsets of F_A that are given in Example 2.3. Let $(F_A,\tilde{m})$ be a soft minimal space where $U = \{u_1, u_2\}$, $E = \{x_1, x_2, x_3\}$, $A = \{x_1, x_2\} \tilde{\subseteq} E$ and $F_A = \{(x_1\{u_1, u_2\}), (x_2\{u_1, u_2\})\}$. Then $\tilde{m} = \{F\Phi, F_{A6}, F_{A8}, F_{A11}, F_A\}$, $\tilde{m}^C = \{F\Phi, F_{A3}, F_{A10}, F_{A7}, F_A\}$,

sg$\tilde{m}$ - closed sets are $F\Phi$, $F_{A1}, F_{A2}, F_{A3}, F_{A4}, F_{A7}, F_{A9}, F_{A10}, F_{A12}, F_{A13}, F_{A14}, F_A$ and

sg*$\tilde{m}$-closed sets are $F\Phi$, $F_{A1}, F_{A2}, F_{A3}, F_{A4}, F_{A7}, F_{A10}, F_{A13}, F_A$.

Theorem 3.3: Every soft $\tilde{m}$-closed set is sg*$\tilde{m}$-closed set.

Proof: Let F_B be soft $\tilde{m}$-closed set in $(F_A,\tilde{m})$ and U_B is sg$\tilde{m}$–open such that $F_B \tilde{\subseteq} U_B$. Then $\tilde{m}$Cl $(F_B) = F_B$ and so $\tilde{m}$Cl $(F_B) \tilde{\subseteq} U_B$. Hence F_B be sg*$\tilde{m}$-closed set.

Theorem 3.4: Every sg*$\tilde{m}$-closed set is sg$\tilde{m}$-closed set.

Proof: Let F_B be sg*-closed set in $(F_A,\tilde{m})$. Let $F_B \tilde{\subseteq} U_B$ where U_B is soft $\tilde{m}$-open. Since every soft $\tilde{m}$-open set is sg$\tilde{m}$-open set. Since F_B is sg*$\tilde{m}$-closed set then we have $\tilde{m}$-Cl $(F_B) \tilde{\subseteq} U_B$. Hence F_B is sg$\tilde{m}$-closed.

Remark 3.5: From the above observation we get the following implication

Soft $\tilde{m}$-closed set $\longrightarrow$ sg*$\tilde{m}$-closed set $\longrightarrow$ sg$\tilde{m}$ -closed set

The reverse implications are not true from the following example

Example 3.6: Let us consider the soft subsets of F_A that are given in Example 2.3. Let $(F_A, \widetilde{m})$ be a soft minimal space where $U = \{u_1, u_2\}$, $E = \{x_1, x_2, x_3\}$, $A = \{x_1, x_2\} \tilde{\subseteq} E$ and $F_A = \{(x_1\{u_1, u_2\}), (x_2\{u_1, u_2\})\}$. Then $\widetilde{m} = \{F\Phi, F_{A6}, F_{A8}, F_{A11}, F_A\}$. See Example 3.2. F_{A2} is sg*$\widetilde{m}$-closed but not soft $\widetilde{m}$ -closed and F_{A12} is sg$\widetilde{m}$-closed but not sg*$\widetilde{m}$-closed.

Theorem 3.7: If F_B and G_B are sg*$\widetilde{m}$-closed sets in $(F_A,\widetilde{m})$ then their union $F_B \cup G_B$ is also sg*$\widetilde{m}$-closed sets in $(F_A,\widetilde{m})$

Proof: Suppose F_B and G_B are sg*$\widetilde{m}$-closed sets in $(F_A,\widetilde{m})$. Let U_B sg$\widetilde{m}$-open of $(F_A,\widetilde{m})$ such that $F_B \cup G_B \tilde{\subseteq} U_B$. Since $F_B \cup G_B \tilde{\subseteq} U_B$, we have $F_B \tilde{\subseteq} U_B$ and $G_B \tilde{\subseteq} U_B$. Since F_B and G_B are sg*$\widetilde{m}$-closed, we have $\widetilde{m}Cl\ (F_B) \tilde{\subseteq} U_B$ and $\widetilde{m}Cl\ (G_B) \tilde{\subseteq} U_B$. Therefore $\widetilde{m}Cl(F_B \cup G_B) \tilde{\subseteq} \widetilde{m}Cl\ (F_B) \cup \widetilde{m}Cl\ (G_B) \tilde{\subseteq} U_B$. Hence $F_B \cup G_B$ is also sg*$\widetilde{m}$-closed set.

Remark 3.8: The intersection of two sg*$\widetilde{m}$-closed sets are need not be sg*$\widetilde{m}$-closed as seen from the following example.

Example 3.9: Let us consider the soft subsets of F_A that are given in Example 2.3. Let $(F_A, \widetilde{m})$ be a soft minimal space where $U = \{u_1, u_2\}$, $E = \{x_1, x_2, x_3\}$, $A = \{x_1, x_2\} \tilde{\subseteq} E$ and $F_A = \{(x_1\{u_1, u_2\}), (x_2\{u_1, u_2\})\}$. Then $\widetilde{m} = \{F\Phi, F_{A1}, F_{A2}, F_{A3}, F_{A7}, F_{A6}, F_{A12}, F_A\}$. Then $F_B = F_{A6}$ and $G_B = F_{A8}$ are sg*$\widetilde{m}$-closed but $F_B \cap G_B = F_{A5}$ is not sg*$\widetilde{m}$-closed set.

Theorem 3.10: For each element $(x,u) \in (F_A, \widetilde{m})$ then singleton $\{(x,u)\}$ is sgm-closed or $\{(x,u)\}^C$ is sg*$\widetilde{m}$-closed set.

Proof: Let $(x,u) \in (F_A, \widetilde{m})$ and the singleton $\{(x,u)\}$ is not sg$\widetilde{m}$-closed. Then $\{(x,u)\}^C$ is not sg$\widetilde{m}$-open set and F_A is the only sg$\widetilde{m}$-open set which contains $\{(x,u)\}^C$ and $\{(x,u)\}^C$ is sg*$\widetilde{m}$-closed set.

Theorem 3.11: Let $(F_A, \widetilde{m})$ be soft minimal space. If F_B is sg*$\widetilde{m}$-closed, then $\widetilde{m}Cl\ (F_B)-F_B$ contains no nonempty sg$\widetilde{m}$-closed.

Proof: Let F_B is sg*$\widetilde{m}$-closed set. Let H_B is a sg$\widetilde{m}$-closed subset of $\widetilde{m}Cl\ (F_B) - F_B$. That is $H_B \tilde{\subseteq} \widetilde{m}Cl\ (F_B)-F_B$. Then $F_B \tilde{\subseteq} H_B^C$, H_B^C is sg$\widetilde{m}$open and hence, $\widetilde{m}Cl\ (F_B) \tilde{\subseteq} H_B^C$. Therefore, we have $H_B \tilde{\subseteq} [\widetilde{m}Cl\ (F_B)]^C$ and hence $H_B \tilde{\subseteq} \widetilde{m}Cl\ (F_B) \cap [\widetilde{m}Cl\ (F_B)]^C = F\Phi$. Hence $H_B = F\Phi$. Therefore $\widetilde{m}Cl\ (F_B)-F_B$ contains no nonempty sg$\widetilde{m}$-closed.

Corollary 3.12: A soft minimal $\tilde{m}$ on a nonempty soft set F_A satisfying property B. If F_B is sg*$\tilde{m}$-closed in $(F_A,\tilde{m})$, then F_B is soft $\tilde{m}$ – closed if and only if $\tilde{m}Cl\ (F_B)$-F_B is sg$\tilde{m}$-closed.

Proof: If F_B is soft $\tilde{m}$-closed, then $\tilde{m}Cl\ (F_B) = F_B$. That is $\tilde{m}Cl\ (F_B) - F_B = F\Phi$ and hence $\tilde{m}Cl\ (F_B)$ - F_B is sg$\tilde{m}$-closed.

Conversely, if $\tilde{m}Cl\ (F_B) - F_B$ is sg$\tilde{m}$-closed, then by Theorem 3.11, $\tilde{m}Cl\ (F_B) - F_B = F\Phi$. Since F_B is sg*$\tilde{m}$-closed. Therefore, F_B is soft $\tilde{m}$ – closed.

Theorem 3.13: If F_B is sg*$\tilde{m}$-closed in $(F_A,\tilde{m})$ and $F_B \tilde{\subseteq} G_B \tilde{\subseteq} \tilde{m}Cl\ (F_B)$, then G_B is sg*$\tilde{m}$-closed.

Proof: Suppose that F_B is sg*$\tilde{m}$-closed set in $(F_A,\tilde{m})$ and $F_B \tilde{\subseteq} G_B \tilde{\subseteq} \tilde{m}Cl\ (F_B)$. Let $G_B \tilde{\subseteq} U_B$ and U_B is sg$\tilde{m}$-open in $(F_A, \tilde{m})$. Since $F_B \tilde{\subseteq} G_B$ and $G_B \tilde{\subseteq} U_B$, we have $F_B \tilde{\subseteq} U_B$. Since F_B is sg*$\tilde{m}$-closed, we have $\tilde{m}Cl\ (F_B) \tilde{\subseteq} U_B$. Since $G_B \tilde{\subseteq} \tilde{m}Cl\ (F_B)$, we have $\tilde{m}Cl\ (G_B) \tilde{\subseteq} \tilde{m}Cl\ (F_B) \tilde{\subseteq} U_B$. Therefore G_B is sg*$\tilde{m}$-closed set.

Definition 3.14: A soft subset F_B of a soft minimal space $(F_A,\tilde{m}$is said to be soft g*$\tilde{m}$-open (briefly sg*$\tilde{m}$-open) if its complement is sg*$\tilde{m}$-closed.

Theorem 3.15: A soft subset F_B of a soft minimal space $(F_A,\tilde{m})$ is sg*$\tilde{m}$-open if and only if $H_B \tilde{\subseteq} \tilde{m}Int\ (F_B)$ whenever $H_B \tilde{\subseteq} F_B$ and H_B is sg$\tilde{m}$-closed.

Proof: Suppose that F_B is sg*$\tilde{m}$-open. Let H_B be a sg$\tilde{m}$-closed set such that $H_B \tilde{\subseteq} F_B$. Then $F_B^C \tilde{\subseteq} H_B^C$ and H_B^C is sg$\tilde{m}$-open, we have F_B^C is sg*$\tilde{m}$-closed. Hence, $\tilde{m}Cl(F_B)^C \tilde{\subseteq} H_B^C$. Consequently, $[\tilde{m}Int\ (F_B)]^C \tilde{\subseteq} H_B^C$. Therefore, $H_B \tilde{\subseteq} \tilde{m}Int\ (F_B)$.

Conversely, assume that $H_B \tilde{\subseteq} \tilde{m}Int\ (F_B)$ whenever $H_B \tilde{\subseteq} F_B$ and H_B is sg$\tilde{m}$-closed. Let $F_B^C \tilde{\subseteq} U_B$ and U_B is sg$\tilde{m}$-open. Then $U_B^C \tilde{\subseteq} F_B$ and U_B^C is sg$\tilde{m}$-closed. By our assumption, we have $U_B^C \tilde{\subseteq} \tilde{m}Int\ (F_B)$. Hence, $[\tilde{m}Int(F_B)]^C \tilde{\subseteq} U_B$. Therefore, $\tilde{m}Cl(F_B)^C \tilde{\subseteq} U_B$ Consequently, F_B^C is sg*$\tilde{m}$closed. Hence, F_B is sg*$\tilde{m}$-open.

Theorem 3.16: If F_B and G_B are sg*$\tilde{m}$-open sets then $F_B \cap G_B$ is also sg*$\tilde{m}$open set.

Proof: Suppose that F_B and G_B are sg*$\tilde{m}$open sets. Let H_B is sg$\tilde{m}$closed set and $H_B \tilde{\subseteq} F_B \cap G_B$. Since $H_B \tilde{\subseteq} F_B \cap G_B$, we have $H_B \tilde{\subseteq} F_B$ and $H_B \tilde{\subseteq} G_B$. Since F_B and G_B are sg*$\tilde{m}$-open sets, we have $H_B \tilde{\subseteq} \tilde{m}$-Int (F_B) and $H_B \tilde{\subseteq} \tilde{m}Int\ (G_B)$. Therefore $H_B \tilde{\subseteq} \tilde{m}Int\ (F_B) \cap \tilde{m}Int\ (G_B) \tilde{\subseteq} \tilde{m}Int\ (F_B \cap G_B)$. Hence $F_B \cap G_B$ is sg*$\tilde{m}$-open set.

Remark 3.17: The union of two sg*$\tilde{m}$-open sets need not be sg*$\tilde{m}$-open set as can seen from the following example.

Example 3.18: Let us consider the soft subsets of F_A that are given in Example 2.3. Let $(F_A, \widetilde{m})$ be a soft minimal space where $U = \{u_1, u_2\}$, $E = \{x_1, x_2, x_3\}$, $A = \{x_1, x_2\} \widetilde{\subseteq} E$ and $F_A = \{(x_1\{u_1, u_2\}), (x_2\{u_1, u_2\})\}$. Then $\widetilde{m} = \{F\Phi, F_{A2}, F_{A3}, F_{A8}, F_{A12}, F_A\}$. Then

sg$\widetilde{m}$-closed sets are $F\Phi, F_{A1}, F_{A4}, F_{A6}, F_{A7}, F_{A7}, F_{A9}, F_{A10}, F_{A13}, F_{A14}, F_A$ and

sg*$\widetilde{m}$-closed sets are $F\Phi, F_{A1}, F_{A6}, F_{A7}, F_{A9}, F_{A10}, F_{A13}, F_A$.

sg*$\widetilde{m}$-open sets are $F\Phi, F_{A12}, F_{A3}, F_{A11}, F_{A2}, F_{A8}, F_{A5}, F_A$.

Here, F_{A2} and F_{A8} are sg*$\widetilde{m}$-open sets but $F_{A2} \cup F_{A8} = F_{A14}$ is not sg*$\widetilde{m}$-open.

Theorem 3.19: Let F_B and G_B be soft subsets of a soft minimal space $(F_A,\widetilde{m})$ such that $\widetilde{m}$Int $(F_B) \widetilde{\subseteq} G_B \widetilde{\subseteq} F_B$. If F_B is sg*$\widetilde{m}$-open, then G_B is sg*$\widetilde{m}$open in $(F_A,\widetilde{m})$.

Proof: Suppose that F_B and G_B be soft subsets of $(F_A,\widetilde{m})$. Let F_B is sg*$\widetilde{m}$-open set in $(F_A,\widetilde{m})$ such that $\widetilde{m}$Int $(F_B) \widetilde{\subseteq} G_B \widetilde{\subseteq} F_B$. Let H_B be a sg$\widetilde{m}$-closed such that $H_B \widetilde{\subseteq} G_B$. Since $H_B \widetilde{\subseteq} G_B$, and $G_B \widetilde{\subseteq} F_B$, we have $H_B \widetilde{\subseteq} F_B$. Since F_B is sg*$\widetilde{m}$-open set, we have $H_B \widetilde{\subseteq} \widetilde{m}$Int (F_B). Since, $\widetilde{m}$Int $(F_B) \widetilde{\subseteq} G_B$, we have $\widetilde{m}$Int$(\widetilde{m}$Int$(F_B)) \widetilde{\subseteq} \widetilde{m}Int(G_B)$. Therefore, $\widetilde{m}$Int$(F_B) \widetilde{\subseteq} \widetilde{m}Int(G_B)$. Consequently, $H_B \widetilde{\subseteq} \widetilde{m}$Int (F_B). Hence G_B is sg*$\widetilde{m}$-open.

Theorem 3.20: If a soft subset F_B of a soft minimal space $(F_A,\widetilde{m})$ is sg*$\widetilde{m}$-closed, then $\widetilde{m}$Cl (F_B) - F_B is sg*$\widetilde{m}$-open.

Proof: Suppose that F_B is sg*$\widetilde{m}$-closed in $(F_A,\widetilde{m})$. Let $H_B \widetilde{\subseteq} \widetilde{m}$Cl (F_B) - F_B and H_B is sg$\widetilde{m}$-closed. Since F_B is sg*$\widetilde{m}$-closed, we have $\widetilde{m}$Cl (F_B) - F_B does not contain nonempty sg$\widetilde{m}$closed by Theorem 3.11. Consequently, $H_B = F\Phi$. Therefore $F\Phi \widetilde{\subseteq} \widetilde{m}Cl(F_B)$- F_B, $F\Phi \widetilde{\subseteq} \widetilde{m}$Int(mCl$(F_B)$- F_B), we obtain $H_B \widetilde{\subseteq} \widetilde{m}Int\{\widetilde{m}Cl(F_B)$- F_B). Hence $\widetilde{m}$Cl (F_B) - F_B is sg*$\widetilde{m}$-open.

Theorem 3.21: If a soft subset F_B is sg*$\widetilde{m}$-open in a soft minimal space $(F_A,\widetilde{m})$, then $G_B = F_A$ whenever G_B is sg$\widetilde{m}$-open and $\widetilde{m}$ Int $(F_B) \cup F_B \widetilde{\subseteq} G_B$.

Proof: Suppose that F_B is sg*$\widetilde{m}$open in a soft minimal space $(F_A,\widetilde{m})$ and G_B is sg$\widetilde{m}$-open and $\widetilde{m}$Int $(F_B) \cup F_B \widetilde{\subseteq} G_B$ implies $G_B{}^C \widetilde{\subseteq} \widetilde{m}$Cl $(F_B{}^C)$ $-F_B{}^C$. Since $F_B{}^C$ is sg*$\widetilde{m}$-closed and $G_B{}^C$ is sg$\widetilde{m}$-closed. Therefore, $\widetilde{m}$Cl $(F_B{}^C)$ $-F_B{}^C$ contains no nonempty sg$\widetilde{m}$-closed set (By Theorem 3.11). Consequently, $G_B{}^C = F\Phi$ and hence $G_B = F_A$.

Remark 3.22: The converse of the above theorem 3.23 is not true in general as can seen from the following example.

Example 3.23: In Example 3.20, if we take $F_B = F_{A9}$, then $\widetilde{m}$ Int $(F_B) \cup F_B \widetilde{\subseteq} F_A$, F_A is sg$\widetilde{m}$-open, but $F_B = F_{A9}$ is not sg*$\widetilde{m}$-open.

4. Conclusion:

In the present work, we have introduced soft g*-closed and open sets in soft minimal spaces which are defined over an initial universe with a fixed set of parameters. We have explored some basic properties of these concepts. Also, we have established several interesting results and presented its fundamental properties with the help of some examples. In future, these findings may be extended to new types of soft generalized closed and open sets in soft minimal spaces.

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