N-Ary Multi Fuzzy Soft Set and N-Ary Multi Fuzzy Soft Matrix

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ABSTRACT
In this work, we present a new ideas of n-ary multi fuzzy soft set, n-ary fuzzy soft matrix and n-ary multi fuzzy soft matrix by joining the characteristics of n-ary relation with the parametrization of multi fuzzy soft set, and constructs the new types named n-ary multi fuzzy soft set and n-ary multi fuzzy soft matrix, also n-ary fuzzy soft matrix is introduced, we center around the fundamental operations and properties for the n-ary multi soft set, n-ary fuzzy soft matrix and n-ary multi fuzzy soft matrix with applied examples. This two new kind of fuzzy soft matrix are more functional, advantageous and contributes in some scientific applications, we will introduce the applications in future.

Keywords
n-ary fuzzy soft set, n-ary multi fuzzy soft set, n-ary fuzzy soft matrix, n-ary multi fuzzy soft matrix.

1. INTRODUCTION
Molodtsov [1] was first started or initiated the soft theory which is the advantage Mathematical instrument. Molodtsov was talked around the functionality of the idea of soft sets for applications in some sort of various and different ways. Maji was examined some theoretical investigation of soft-sets such as; soft sub set, not set, equality involving two soft sets. And they discussed some main applications on soft sets, for example, the 'union', the 'intersection', the 'and' and 'or' operations. In [2] Haci Aktas et.al imported some initial important soft sets components in addition to compare soft sets towards the related ideas associated with rough-sets and fuzzy sets. Ahmad and Kharal [3] presented the main notations on mapping of soft classes and also presented some main properties of images of soft sets in which these can be applied in some main problems of medical diagnosis. In [4] Das and Borgahain was studied around fuzzy soft set and that may be applied on a multi criteria multi observer decision making problems and difficulties.
Recently, the research on the soft set theory has been so active, and rapidly and great progress has been achieved [5–9]. It is worth noting that all of those works are based on the classical soft set theory.
Fuzzy set originally proposed by Zadeh in [10] of 1965. After semblance of the concept of fuzzy set, researcher given much attention to developed fuzzy set theory. Maji et al. [11] introduced the concept of fuzzy soft sets. Afterwards, many researchers have worked on this concept. Roy and Maji [12] provided some results
on an application of fuzzy soft sets in decision making problems. F. Feng et al. give application in decision making problem [13, 14].
The authors [15] proposed the concept of the multi-fuzzy soft set which is more general fuzzy set using ordinary fuzzy sets. The notion of multi-fuzzy soft sets provides a new method to represent some problems which are difficult to explain in other extensions of fuzzy soft set theory.
Yong& Chenli [17] and Cagman & Engino [18], first defined fuzzy soft matrices, which are representation of the fuzzy soft sets. Also they constructed a fuzzy soft-decision making method which is more practical and can be successfully applied to many problems. Also some authors proposed some kinds and properties of fuzzy soft matrix theory and some application (see [19-21]) .
In the present idea, our motivation is to present a new type of fuzzy soft set contains the concept of n-ary relation on many sets of parameters with the concept of multi fuzzy soft set which enable us to apply in one of the important scientific fields.
This article consists of 4 sections. In Section 1, we mention some main definitions and concepts of n-ary fuzzy soft set which we are need in this our work. In Section 2, we introduce the definition of n-ary multi fuzzy soft set with example. In Section 3, we introduce the important and main operations on n-ary multi fuzzy soft sets, with illustrative example. In Section 4 introduce a new definition of (n-ary fuzzy soft matrix) with example. In Section 4 introduce the important and main operations on n-ary multi fuzzy soft matrix, with illustrative example.

2. PRELIMINARIES
In the following some concepts and definitions about n-ary fuzzy soft set which we are need in this paper.
Definition 2.1. [16] Let $\mathfrak{X}$ be an initial universe set and $\mathcal{E}_1, \ldots, \mathcal{E}_n$ be a different sets of parameters. Let $\mathcal{P}(\mathfrak{X})$ denotes the power set of $\mathfrak{X}$.
$\#\not{f}\mathscr{s}(e_1, \ldots, e_n)$ by a n-ary fuzzy soft set over $\mathfrak{X}$ for all $e_i \in \mathcal{E}_i \ \forall \ i = 1, \ldots. . n$.
Is representing a composite fuzzy set with n-ary soft set $\#\not{f}\mathscr{s}(e_1, \ldots, e_n) = (\not{f}^\circ \mathscr{s})(e_1, \ldots, e_n)$, $\forall e_i \in \mathcal{E}_i$, $\forall \ i = 1, \ldots. . n$
Where $\mathscr{s}: (\prod_{i=1}^{n} \mathcal{E}_i) = \mathcal{E}_1 \times \ldots \times \mathcal{E}_n \rightarrow \mathcal{P}(\mathfrak{X})$ is n-ary soft set and be afuzzy set with respect to power set $\#\not{f}: \mathcal{P}(\mathfrak{X}) \rightarrow$ I;I=[0,1] . Then $\# \not{f}\mathscr{s}: \prod_{i=1}^{n} \mathcal{E}_i \rightarrow I$
$\#\not{f}\mathscr{s} = \{((e_1, \ldots, e_n), (\not{f}^\circ \mathscr{s})(e_1, \ldots, e_n)), \forall e_i \in \mathcal{E}_i \ , \forall \ i = 1, \ldots. . n \}$
Definition 2.2. [16] A n-ary fuzzy soft set $\#\not{f}\mathscr{s}$ is said to be a null n-ary fuzzysoft set if $\#\not{f}\mathscr{s}(e_1, \ldots, e_n) = 0$ for all $e_i \in \mathcal{E}_i$; $i = 1, \ldots, n$, we write $0(e_1, \ldots, e_n) = 0, e_i \in \mathcal{E}_i$; $i = 1, \ldots, n$.Then $\# \not{f}\mathscr{s}: \prod_{i=1}^{n} \mathcal{E}_i \rightarrow 0$
$\#\not{f}\mathscr{s} = \{((e_1, \ldots, e_n), 0), \forall e_i \in \mathcal{E}_i \ , \forall \ i = 1, \ldots. . n \}$
Definition 2.3.[16] A n-ary fuzzy soft set $\#\not{f}\mathscr{s}$ is said to be a universal n-ary fuzzysoft set if $\#\not{f}\mathscr{s}(e_1, \ldots, e_n) = 1$ for all $e_i \in \mathcal{E}_i$; $i = 1, \ldots, n$
Then $\# \not{f}\mathscr{s}: \prod_{i=1}^{n} \mathcal{E}_i \rightarrow 1$
$\#\not{f}\mathscr{s} = \{((e_1, \ldots, e_n), 1), \forall e_i \in \mathcal{E}_i \ , \forall \ i = 1, \ldots. . n \}$
Definition 2.4. [16] The complement of n-ary fuzzy soft set $\#\not{f}\mathscr{s}$ over $\mathfrak{X}$ is denoted by $(\#\not{f}\mathscr{s})^c$ and is defined bywhere

$(\#\mathcal{fs})^c: \mathcal{E}_1 \times \ldots \times \mathcal{E}_n \to I$ is a mapping given by $(\#\mathcal{fs})^c(e_1, \ldots, e_n) = 1 - \#\mathcal{fs}(e_1, \ldots, e_n)$ for all $e_i \in \mathcal{E}_i$; $i = 1, \ldots, n$.

Definition 2.5. [16] Let $\varkappa \in I = [0,1]$. Then denotes $\#\mathcal{fs}$ the n-ary fuzzy soft set over $\mathfrak{X}$ for which $\#\mathcal{fs}(e_1, \ldots, e_n) = \varkappa$, for all $e_i \in \mathcal{E}_i$; $i = 1, \ldots, n$.

Definition 2.6. [16] For two n-ary fuzzy soft sets $\#\mathcal{fs}$ and $\#\mathcal{fg}$ over a common universe$\mathfrak{X}$, we say that$\#\mathcal{fs}$ is n-ary fuzzy soft subset of $\#\mathcal{fg}$ denoted by

$\#\mathcal{fs} \widetilde{\subseteq} \#\mathcal{fg}$ if $\#\mathcal{fs}(e_1, \ldots, e_n) \lesssim \#\mathcal{fg}(e_1, \ldots, e_n)$for all $e_i \in \mathcal{E}_i$; $i = 1, \ldots, n$.

$\#\mathcal{fg}$ is said to be n-ary fuzzy soft super set of $\#\mathcal{fs}$ iff $\#\mathcal{fs}$ is n-ary fuzzy soft subset of $\#\mathcal{fg}$.

Twon-ary fuzzy soft sets $\#\mathcal{fs}$ and $\#\mathcal{fg}$are said to be equal, denoted $\#\mathcal{fs}$=$\#\mathcal{fg}$, iff $\#\mathcal{fs}(e_1, \ldots, e_n) \lesssim \#\mathcal{fg}(e_1, \ldots, e_n)$ and $\#\mathcal{fg}(e_1, \ldots, e_n) \lesssim \#\mathcal{fs}(e_1, \ldots, e_n)$ for all $e_i \in \mathcal{E}_i$; $i = 1, \ldots, n$ Definition 2.7. [16] The Union of two n-ary fuzzy soft sets $\#\mathcal{fs}$ and $\#\mathcal{fg}$ over the common universe $\mathfrak{X}$ is the n-ary fuzzy soft set $\#\mathcal{fh}$where $\#\mathcal{fh}(e_i, \ldots, e_n) = (\#\mathcal{fs} \cup \#\mathcal{fg})(e_i, \ldots, e_n)$then

$\#\mathcal{fh}(e_i, \ldots, e_n) = \max\{\#\mathcal{fs}(e_i, \ldots, e_n), \#\mathcal{fg}(e_i, \ldots, e_n)\}$for all $e_i \in \mathcal{E}_i$; $i = 1, \ldots, n$.

Definition 2.8. [16] The intersection of two n-ary fuzzy soft sets $\#\mathcal{fs}$ and $\#\mathcal{fg}$ over the common universe $\mathcal{X}$ is the n-ary fuzzy soft set $\#\mathcal{fh}$, where

$\#\mathcal{fh}(e_i, \ldots, e_n) = (\#\mathcal{fs} \cap \#\mathcal{fg})(e_i, \ldots, e_n)$ for all $e_i \in \mathcal{E}_i$; $i = 1, \ldots, n$.

$\#\mathcal{fh}(e_i, \ldots, e_n) = \min\{\#\mathcal{fs}(e_i, \ldots, e_n), \#\mathcal{fg}(e_i, \ldots, e_n)\}$for all $e_i \in \mathcal{E}_i$; $i = 1, \ldots, n$.

Definition 2.9. [16] The difference $\#\mathcal{fh}$ of two n-ary fuzzy soft sets $\#\mathcal{fs}$ and $\#\mathcal{fg}$ over the common universe $\mathfrak{X}$, denoted by is defined $\#\mathcal{fs} - \#\mathcal{fg} = \#\mathcal{fs} \cap (\#\mathcal{fg})^c$, $\#\mathcal{fh}(e_i, \ldots, e_n) = \min\{\#\mathcal{fs}(e_i, \ldots, e_n), (\#\mathcal{fg}(e_i, \ldots, e_n))^c\}$ for all $e_i \in \mathcal{E}_i$; $i = 1, \ldots, n$.

3. N-ARY MULTI FUZZY SOFT SET

3.1 Definition

Let $\mathfrak{X}$ be an initial universe set and $\mathcal{E}_1, \ldots, \mathcal{E}_n$ be a different sets of parameters, then **the n-ary multi fuzzy soft set** is a mapping $\#\mathcal{fs}^{\kappa}: \prod_{i=1}^{n} \mathcal{E}_i \to I^{\kappa}$; $i = 1, \ldots\ldots n$; $\kappa \in \mathcal{N}$, where $\mathcal{N}$ is th set of natural numbers. And $\#\mathcal{fs}^{\kappa}(e_1, \ldots, e_n) = ((\mathcal{f}^{\circ}\mathcal{s})(e_1, \ldots, e_n))^{\kappa}, \forall e_i \in \mathcal{E}_i$, $i = 1, \ldots\ldots n$

(i.e.Let$\mathcal{r} \in I = [0,1]$.Then $\#\mathcal{fs}^{\kappa}(e_1, \ldots, e_n) = (\underbrace{\mathcal{r}, \mathcal{r}, \ldots, \mathcal{r}}_{k-time})$, for all $e_i \in \mathcal{E}_i$; $i = 1, \ldots, n, \kappa \in \mathcal{N}$**)**

If $\kappa = 1$ then we obtain **n-ary fuzzy soft set (ordinary)**

3.2Example suppose that there are five phones in the univarsal set $\mathfrak{X}$ by which operated by $\mathfrak{X} = \{\varkappa_1, \varkappa_2, \varkappa_3, \varkappa_4, \varkappa_5\}$many plat forms such that $\mathcal{E}_1, \mathcal{E}_2, \mathcal{E}_3, \mathcal{E}_4$ be a different sets of parameters ,$\mathcal{E}_1 = \{\zeta_1 = \text{Amocos}\}$, $\mathcal{E}_2 = \{\eta_1 = \text{windous}\}$, $\mathcal{E}_3 = \{\rho_1 = \text{soloris}, \rho_2 = \text{QNX}\}$, $\mathcal{E}_4 = \{\delta_1 = \text{Macintosh}\}$

, then **4-ary multi fuzzy soft set** if κ =1 $\#\mathcal{fs} = \{((\zeta_1, \eta_1, \rho_1, \delta_1), (0.5)), ((\zeta_1, \eta_1, \rho_2, \delta_1), (0.9))\}$

, then **4-ary multi fuzzy soft set** if $\kappa = 2 \#\mathcal{fs}^2 = \{((\zeta_1, \eta_1, \rho_1, \delta_1), (0.3, 0.2)), ((\zeta_1, \eta_1, \rho_2, \delta_1), (0.1, 0.4))\}$And then **4-ary multi fuzzy soft set** if $\kappa = 3$

$\#\mathcal{fs}^3 = \{((\zeta_1, \eta_1, \rho_1, \delta_1), (0.3, 0.2, 0)), ((\zeta_1, \eta_1, \rho_2, \delta_1), (1, 0.1, 0.4))\}$

Operations on N-Ary Multi Fuzzy Soft Set

3.3 Definition A n-ary fuzzy soft set $\#\mathcal{fs}^{\kappa}$ is said to be **a null n-ary multi fuzzysoft** set if $\mathcal{fs}^{\kappa}(e_1, \ldots, e_n) = (\underbrace{0, \ldots, 0}_{\kappa-time})$ for all $e_i \in \mathcal{E}_i$; $i = 1, \ldots, n, \kappa \in \mathcal{N}$,then $\#\mathcal{fs}^{\kappa}: \prod_{i=1}^{n} \mathcal{E}_i \to (\underbrace{0, \ldots, 0}_{\kappa-time})$, i.e.

$$\#\mathcal{fs}^{\kappa} = \left\{\left((e_1, \ldots, e_n), (\underbrace{0, \ldots, 0}_{\kappa-time})\right), \forall e_i \in \mathcal{E}_i \, , i = 1, \ldots, n \, , \kappa \in \mathcal{N}\right\}$$

3.4Definition A n-ary multi fuzzy soft set $\#\mathcal{fs}^{\kappa}$ is said to be a **universal n-ary multi fuzzysoft set** if $\#\mathcal{fs}^{\kappa}(e_1, \ldots, e_n) = (\underbrace{1, \ldots, 1}_{\kappa-time})$ for all $e_i \in \mathcal{E}_i$; $i = 1, \ldots, n, \kappa \in \mathcal{N}$

Then $\#\mathcal{fs}^{\kappa}: \prod_{i=1}^{n} \mathcal{E}_i \to (\underbrace{1, \ldots, 1}_{\kappa-time})$

$$\#\mathcal{fs}^{\kappa} = \left\{\left((e_1, \ldots, e_n), (\underbrace{1, \ldots, 1}_{k-time})\right), \forall e_i \in \mathcal{E}_i \, , i = 1, \ldots, n, \kappa \in \mathcal{N}\right\}$$

3.5 Definition The complement of n-ary multi fuzzy soft set $\#\mathcal{fs}^{\kappa}$ over $\mathfrak{X}$ is denoted by $(\#\mathcal{fs}^{\kappa})^c$ and is defined bywhere $(\#\mathcal{fs}^{\kappa})^c: \mathcal{E}_1 \times \ldots \times \mathcal{E}_n \to I^k$ is a mapping given by $(\#\mathcal{fs}^{\kappa})^c(e_1, \ldots, e_n) = 1 - \#\mathcal{fs}^{\kappa}(e_1, \ldots, e_n)$ for all $e_i \in \mathcal{E}_i$; $i = 1, \ldots, n, \kappa \in \mathcal{N}$.

3.6 Definition For two n-ary multi fuzzy soft sets $\#\mathcal{fsh}^{\kappa}$ and $\#\mathcal{fsg}^{k}$over a common universe$\mathfrak{X}$, such that

$$\#\mathcal{fsh}^{\kappa} = \left\{\left((e_1, \ldots, e_n), (\underbrace{\ell_1, \ell_2, ,, \ell_k}_{k-time})\right), \forall e_i \in \mathcal{E}_i \, , \forall \; i = 1, \ldots\ldots n, \kappa \in \mathcal{N}\right\}$$

And

$$\#\mathcal{fsg}^{k} = \left\{\left((e_1, \ldots, e_n), (\underbrace{\mathcal{T}_1, \mathcal{T}_2, ,, \mathcal{T}_k}_{k-time})\right), \forall e_i \in \mathcal{E}_i \, , \forall \; i = 1, \ldots\ldots n, \kappa \in \mathcal{N}\right\}$$

We say that$\#\mathcal{fsh}^{\kappa}$ is **n-ary multi fuzzy soft subset** of $\#\mathcal{fsg}^{k}$denoted by $\#\mathcal{fsh}^{\kappa} \widetilde{\subseteq} \#\mathcal{fsg}^{k}$iff $\#\mathcal{fsh}^{\kappa}(e_1, \ldots, e_n) \lesssim \#\mathcal{fsg}^{k}(e_1, \ldots, e_n)$, i.e. $\ell_j \lesssim \mathcal{T}_j$, for all $j = 1,2,,,k$; and $e_i \in \mathcal{E}_i$; $i = 1, \ldots, n$, $k \in \mathcal{N}$.Then $\#\mathcal{fsg}^{k}$ is said to be **n-ary multi fuzzy soft super set** of $\#\mathcal{fsh}^{\kappa}$iff $\#\mathcal{fsh}^{\kappa}$is n-ary multi fuzzy soft subset of $\#\mathcal{fsg}^{\kappa}$.

Twon-ary fuzzy soft sets $\#\mathcal{fsh}^{\kappa}$ and $\#\mathcal{fsg}^{\kappa}$are said to be equal, denoted by $\#\mathcal{fsh}^{\kappa}$=$\#\mathcal{fsg}^{\kappa}$, iff $\#\mathcal{fsh}^{\kappa}(e_1, \ldots, e_n) \lesssim \#\mathcal{fsg}^{k}(e_1, \ldots, e_n)$, i.e. $\ell_j \lesssim \mathcal{T}_j$, and $\#\mathcal{fsg}^{k}(e_1, \ldots, e_n) \lesssim \#\mathcal{fsh}^{\kappa}(e_1, \ldots, e_n)$, i.e. $\mathcal{T}_j \lesssim \ell_j$ for all $j = 1,2,,,\kappa$; $e_i \in \mathcal{E}_i$; $i = 1, \ldots, n, \kappa \in \mathcal{N}$.

3.7 Definition The **Union of two n-ary multi fuzzy soft sets**$\#\mathcal{fsh}^{\kappa}$ and $\#\mathcal{fsg}^{\kappa}$ over the common universe $\mathfrak{X}$ is the n-ary multi fuzzy soft set denoted by $\#\mathcal{fsw}^{\kappa}$, where

$$\#\mathcal{fsw}^{\kappa}(e_i, \ldots, e_n) = (\#\mathcal{fsh}^{\kappa} \cup \#\mathcal{fsg}^{\kappa})(e_i, \ldots, e_n) = \max\{\#\mathcal{fsh}^{\kappa}(e_i, \ldots, e_n), \#\mathcal{fsg}^{\kappa}(e_i, \ldots, e_n)\}$$

i.e. $\#\mathcal{fsw}^{\kappa}(e_i, \ldots, e_n) = \max\{(\ell_j, \mathcal{T}_j)\}$ for all $e_i \in \mathcal{E}_i$; $i = 1, \ldots, n$; $j = 1,2, \ldots, \kappa$, $\kappa \in \mathcal{N}$.

3.8 Definition The **intersection of two n-ary multi fuzzy soft sets**$\#\mathscr{fsh}^{\kappa}$ and $\#\mathscr{fsg}^{\kappa}$ over the common universe $\mathfrak{X}$ is the n-ary multi fuzzy soft set denoted by $\#\mathscr{fsw}^{\kappa}$, where

$$\#\mathscr{fsw}^{\kappa}(e_i,\dots,e_n)$$
$$= (\#\mathscr{fsh}^{\kappa} \cup \#\mathscr{fsg}^{\kappa})(e_i,\dots,e_n)$$
$$= \min\{\#\mathscr{fsh}^{\kappa}(e_i,\dots,e_n), \#\mathscr{fsg}^{\kappa}(e_i,\dots,e_n)\}$$

i.e. $\#\mathscr{fsw}^{\kappa}(e_i,\dots,e_n) = \min\{(\ell_{j},\mathcal{T}_{j})\}$ for all $e_i \in \mathcal{E}_i$; $i = 1,\dots,n; j = 1,2,\dots,\kappa$, $\kappa \in \mathcal{N}$.

3.9 Definition Thedifference **of two n-ary multi fuzzy soft sets**$\#\mathscr{fsh}^{\kappa}$ and $\#\mathscr{fsg}^{\kappa}$ over the common universe $\mathfrak{X}$ is the n-ary multi fuzzy soft set denoted by $\#\mathscr{fsw}^{\kappa}$, where $\#\mathscr{fsw}^{\kappa} = \#\mathscr{fsh}^{\kappa} - \#\mathscr{fsg}^{\kappa} = \#\mathscr{fsh}^{\kappa} \cap (\#\mathscr{fsg}^{\kappa})^{C} = min\{\#\mathscr{fsh}^{\kappa}(e_1,\dots,e_n), (\#\mathscr{fsg}^{\kappa}(e_1,\dots,e_n))^{c}\}$, for all $e_i \in \mathcal{E}_i$; $i = 1,\dots,n$; $\kappa \in \mathcal{N}$.

3.10 Exmaple Suppose that $\mathfrak{X}=\{\varkappa_1,\varkappa_2,\varkappa_3,\varkappa_4,\varkappa_5\}$ is the set color cloths under consideration$\mathcal{E}_1,\mathcal{E}_2,\mathcal{E}_3$is the set of parameters. Let $\mathcal{E}_1$ be a set of color parameters given by; $\mathcal{E}_1 = \{\zeta_1$=red },let $\mathcal{E}_2$ be a set of which is made from parameters given by ; $\mathcal{E}_2 = \{\eta_1$=wool, η_2 = cotton, η_3 = acrylic }, and let $\mathcal{E}_3$ be a set of price parameters given by; $\mathcal{E}_3 = \{\rho_1$=high, ρ_2=low}

If

$\kappa = 3$ and $n = 3 \rightarrow \#\mathscr{fs}^3: \prod_{i=1}^{3} \mathcal{E}_i \rightarrow I^3 \#\mathscr{fs}^3(e_1,e_2,e_3) = ((\mathscr{f}^{\circ}\mathscr{s})(e_1,e_2,e_3))^{3} = (\mathscr{r}_1,\mathscr{r}_2,\mathscr{r}_3), \forall e_i \in \mathcal{E}_i$, $\forall$ $i = 1,2,3$; $\mathscr{r}_1,\mathscr{r}_2,\mathscr{r}_3 \in I$.

Then

$\#\mathscr{fs}^3(\zeta_1,\eta_1,\rho_1) = (0.2,0,0.6)$, $\#\mathscr{fs}^3(\zeta_1,\eta_2,\rho_1) = (0.1,0,0.4)$,
$\#\mathscr{fs}^3(\zeta_1,\eta_3,\rho_1) = (0.3,0.5,0.7)$, $\#\mathscr{fs}^3(\zeta_1,\eta_1,\rho_2) = (1,0.8,0.6)$
$\#\mathscr{fs}^3(\zeta_1,\eta_2,\rho_2) = (0.9,0.6,1)$, $\#\mathscr{fs}^3(\zeta_1,\eta_3,\rho_2) = (0.2,0.4,0.8)$

And

$\#\mathscr{fsg}^3(\zeta_1,\eta_1,\rho_1) = (0.1,0,0.6)$, $\#\mathscr{fsg}^3(\zeta_1,\eta_2,\rho_1) = (0.1,0,0.3)$,
$\#\mathscr{fsg}^3(\zeta_1,\eta_3,\rho_1) = (0.3,0.4,0.5)$, $\#\mathscr{fsg}^3(\zeta_1,\eta_1,\rho_2) = (0.9,0.8,0.6)$
$\#\mathscr{fsg}^3(\zeta_1,\eta_2,\rho_2) = (0.2,0.5,1)$, $\#\mathscr{fsg}^3(\zeta_1,\eta_3,\rho_2) = (0.1,0.1,0.8)$

then it is clear that, $\#\mathscr{fsg}^3(\zeta_i,\eta_j,\rho_k) \lesssim \#\mathscr{fss}^3(\zeta_i,\eta_j,\rho_k)$.

Such that $\zeta_1 \in \mathcal{E}_1$, $\eta_j \in \mathcal{E}_2$ and $\rho_k \in \mathcal{E}_3$; $i = 1, j = 1,2,3$, $k = 1,2$.

Let$\#\mathscr{fsn}^3$ be a **null trinary multi fuzzysoft set,** where;
$\#\mathscr{fsn}^3(\zeta_1,\eta_1,\rho_1) = (0,0,0)$, $\#\mathscr{fsn}^3(\zeta_1,\eta_2,\rho_1) = (0,0,0)$,
$\#\mathscr{fsn}^3(\zeta_1,\eta_3,\rho_1) = (0,0,0)$, $\#\mathscr{sn}^3(\zeta_1,\eta_1,\rho_2) = (0,0,0)$
$\#\mathscr{fsn}^3(\zeta_1,\eta_2,\rho_2) = (0,0,0)$, $\#\mathscr{fsn}^3(\zeta_1,\eta_3,\rho_2) = (0,0,0)$

Let $\#\mathscr{f}\mathcal{U}^3$be a **universal trinary multi fuzzy soft set**, where;
$\#\mathscr{f}\mathcal{U}^3(\zeta_1,\eta_1,\rho_1) = (1,1,1)$, $\#\mathscr{f}\mathcal{U}^3(\zeta_1,\eta_2,\rho_1) = (1,1,1)$,
$\#\mathscr{f}\mathcal{U}^3(\zeta_1,\eta_3,\rho_1) = (1,1,1)$, $\#\mathscr{f}\mathcal{U}^3(\zeta_1,\eta_1,\rho_2) = (1,1,1)$
$\#\mathscr{f}\mathcal{U}^3(\zeta_1,\eta_2,\rho_2) = (1,1,1)$, $\#\mathscr{f}\mathcal{U}^3(\zeta_1,\eta_3,\rho_2) = (1,1,1)$

The complement $(\#\mathscr{fs}^3)^C$ is;
$(\#\mathscr{fs}^3)^C(\zeta_1,\eta_1,\rho_1) = (0.8,1,0.4)$,$(\#\mathscr{fs}^3)^C(\zeta_1,\eta_2,\rho_1) = (0.9,1,0.6)$,
$(\#\mathscr{fs}^3)^C(\zeta_1,\eta_3,\rho_1) = (0.7,0.5,0.3)$,$(\#\mathscr{fs}^3)^C(\zeta_1,\eta_1,\rho_2) = (0,0.2,0.4)$
$(\#\mathscr{fs}^3)^C(\zeta_1,\eta_2,\rho_2) = (0.1,0.4,0)$,$(\#\mathscr{fs}^3)^C(\zeta_1,\eta_3,\rho_2) = (0.8,0.6,0.2)$. And
$(\#\mathscr{fsg}^3)^C(\zeta_1,\eta_1,\rho_1) = (0.9,1,0.4)$, $(\#\mathscr{fsg}^3)^C(\zeta_1,\eta_2,\rho_1) = (0.9,1,0.7)$,
$(\#\mathscr{fsg}^3)^C(\zeta_1,\eta_3,\rho_1) = (0.7,0.6,0.5)$,$(\#\mathscr{fsg}^3)^C(\zeta_1,\eta_1,\rho_2) = (0.1,0.2,0.4)$
$(\#\mathscr{fsg}^3)^C(\zeta_1,\eta_2,\rho_2) = (0.8,0.5,0)$,$(\#\mathscr{fsg}^3)^C(\zeta_1,\eta_3,\rho_2) = (0.9,0.9,0.2)$

And let $\#\mathscr{fs}\mathcal{D}^3$ be a trinary multi fuzzysoft set, where;
$\#\mathscr{fs}\mathcal{D}^3(\zeta_1,\eta_1,\rho_1) = (0.2,0.2,0.2)$, $\#\mathscr{fs}\mathcal{D}^3(\zeta_1,\eta_2,\rho_1) = (0.2,0.2,0.2)$,
$\#\mathscr{fs}\mathcal{D}^3(\zeta_1,\eta_3,\rho_1) = (0.2,0.2,0.2)$, $\#\mathscr{fs}\mathcal{D}^3(\zeta_1,\eta_1,\rho_2) = (0.2,0.2,0.2)$
$\#\mathscr{fs}\mathcal{D}^3(\zeta_1,\eta_2,\rho_2) = (0.2,0.2,0.2)$, $\#\mathscr{fs}\mathcal{D}^3(\zeta_1,\eta_3,\rho_2) = (0.2,0.2,0.2)$

The intersection
$\#\mathscr{fs}^3(\zeta_i,\eta_j,\rho_k) \cap \#\mathscr{fsg}^3(\zeta_i,\eta_j,\rho_k) = \#\mathscr{fs}\mathcal{H}^3(\zeta_i,\eta_j,\rho_k)$,
such that **{**$\zeta_i \in \mathcal{E}_1$, $\eta_j \in \mathcal{E}_2$ and $\rho_k \in \mathcal{E}_3$; $i = 1, j = 1,2,3$, $k = 1,2$ } then :
$\#\mathscr{fs}\mathcal{H}^3(\zeta_1,\eta_1,\rho_1) = (0.1,0,0.6)$, $\#\mathscr{fs}\mathcal{H}^3(\zeta_1,\eta_2,\rho_1) = (0.1,0,0.3)$,
$\#\mathscr{fs}\mathcal{H}^3(\zeta_1,\eta_3,\rho_1) = (0.3,0.4,0.5)$, $\#\mathscr{fs}\mathcal{H}^3(\zeta_1,\eta_1,\rho_2) = (0.9,0.8,0.6)$
$\#\mathscr{fs}\mathcal{H}^3(\zeta_1,\eta_2,\rho_2) = (0.2,0.5,1)$, $\#\mathscr{fs}\mathcal{H}^3(\zeta_1,\eta_3,\rho_2) = (0.1,0.1,0.8)$

The union $\#\mathscr{fs}^3(\zeta_i,\eta_j,\rho_k) \cup \#\mathscr{fsg}^3(\zeta_i,\eta_j,\rho_k) = \#\mathscr{fs}\mathcal{A}^3(\zeta_i,\eta_j,\rho_k)$, such that **{**$\zeta_i \in \mathcal{E}_1$, $\eta_j \in \mathcal{E}_2$ and $\rho_k \in \mathcal{E}_3$, $i = 1, j = 1,2,3$, $k = 1,2$} then :
$\#\mathscr{fs}\mathcal{A}^3(\zeta_1,\eta_1,\rho_1) = (0.2,0,0.6)$, $\#\mathscr{fs}\mathcal{A}^3(\zeta_1,\eta_2,\rho_1) = (0.1,0,0.4)$,
$\#\mathscr{fs}\mathcal{A}^3(\zeta_1,\eta_3,\rho_1) = (0.3,0.5,0.7)$, $\#\mathscr{fs}\mathcal{A}^3(\zeta_1,\eta_1,\rho_2) = (1,0.8,0.6)$
$\#\mathscr{fs}\mathcal{A}^3(\zeta_1,\eta_2,\rho_2) = (0.9,0.6,1)$, $\#\mathscr{fs}\mathcal{A}^3(\zeta_1,\eta_3,\rho_2) = (0.2,0.4,0.8)$

And The deference $\#\mathscr{fsp}^3 = \#\mathscr{fs}^3 - \#\mathscr{fsg}^3 = \#\mathscr{fs}^3 \cap (\#\mathscr{fsg}^3)^C$, such that :
$\#\mathscr{fsp}^3(\zeta_1,\eta_1,\rho_1) = (0.1,0,0.4)$, $\#\mathscr{fsp}^3(\zeta_1,\eta_2,\rho_1) = (0.1,0,0.4)$, $\#\mathscr{fs}\mathcal{A}^3(\zeta_1,\eta_3,\rho_1) = (0.3,0.5,0.5)$, $\#\mathscr{fsp}^3(\zeta_1,\eta_1,\rho_2) = (1,0.2,0.4)$$\#\mathscr{fsp}^3(\zeta_1,\eta_2,\rho_2) = (0.8,0.5,0)$, $\#\mathscr{fsp}^3(\zeta_1,\eta_3,\rho_2) = (0.2,0.4,0.2)$

4. N-ARY FUZZY SOFT MATRIX

4.1 Defintion

The **n-ary fuzzy soft set** is a mapping $\#\mathscr{fs}: \prod_{i=1}^{n} \mathcal{E}_i \rightarrow I$; $i = 1,\dots,n$, i.e. $\#\mathscr{fs}(e_1,\dots,e_n) = ((\mathscr{f}^{\circ}\mathscr{s})(e_1,\dots,e_n))$, $\forall e_i \in \mathcal{E}_i$, $i = 1,\dots.n$ Then **n-ary fuzzy soft matrix** denoted by $\#\mathcal{M}\mathscr{fs}$ such that:

$$\#\mathcal{M}\mathscr{fs} : \left(\left(\prod_{i=1}^{n} \mathcal{E}_i\right) = (\mathcal{E}_1 \times \dots \times \mathcal{E}_n\right) \rightarrow I; i = 1,\dots,n$$

$\#\mathcal{M}\mathscr{fs}$can be represented by the following table (matrix) :
If i =1,2 and $\kappa = 1$ then :
Then $\#\mathcal{M}\mathscr{fs}$can be represented by the following :

$\#\mathcal{M}\mathscr{fs}$	$(\mathcal{E}_1)$
$(\mathcal{E}_2)$	$\#\mathscr{fs}(e_1,e_2) = \mathscr{r}$, where $e_1 \in \mathcal{E}_1, e_2 \in \mathcal{E}_2$and $\mathscr{r} \in I$

If i =1,2,3 and $\kappa = 1$ then :

$\#\mathcal{M}\mathscr{fs}$	$(\mathcal{E}_1 \times \mathcal{E}_2)$
$(\mathcal{E}_3)$	$\#\mathscr{fs}(e_1,e_2,e_3) = \mathscr{r}$, where $e_1 \in \mathcal{E}_1, e_2 \in \mathcal{E}_2, e_3 \in \mathcal{E}_3$ and $\mathscr{r} \in I$

If n is even , $\kappa = 1$ then :

$\#\mathcal{M}\mathscr{fs}$	$\left(\mathcal{E}_1 \times \dots \times \mathcal{E}_{\frac{n}{2}}\right)$
$\left(\mathcal{E}_{\frac{n}{2}+1} \times \dots \times \mathcal{E}_n\right)$	$\#\mathscr{fs}(e_1,\dots,e_n) = \mathscr{r}$; $\forall e_i \in \mathcal{E}_i$, $i = 1,\dots,n$and $\mathscr{r} \in I$

If n is odd , $\kappa = 1$ then :

$\#\mathcal{M}\mathscr{fs}$	$\left(\mathcal{E}_1 \times \dots \times \mathcal{E}_{\frac{n+1}{2}}\right)$
$\left(\mathcal{E}_{\frac{n+3}{2}} \times \dots \times \mathcal{E}_n\right)$	$\#\mathscr{fs}(e_1,\dots,e_n) = \mathscr{r}$; $\forall e_i \in \mathcal{E}_i$, $i = 1,\dots.n$and $\mathscr{r} \in I$

4.2 Example

With respect to the exmple 1.2 , the 4-ary fuzzy soft martix be as follows; If i =1,2,3,4 and $\kappa = 1$ then :

$\#\mathcal{Mfs}$		$(\mathcal{E}_1 \times \mathcal{E}_2)$
		(ζ_1, η_1)
$(\mathcal{E}_3 \times \mathcal{E}_4)$	(ρ_1, δ_1)	$(\zeta_1, \eta_1, \rho_1, \delta_1)$ =0.5 $(\zeta_1, \eta_1, \rho_2, \delta_1)$ =0.9

If i =1,2,3,4 and $\kappa = 2$ then :

$\#\mathcal{Mfs}^2$		$(\mathcal{E}_1 \times \mathcal{E}_2)$
		(ζ_1, η_1)
$(\mathcal{E}_3 \times \mathcal{E}_4)$	(ρ_1, δ_1)	$(\zeta_1, \eta_1, \rho_1, \delta_1) = (0.3,0.2)$
	(ρ_2, δ_1)	$(\zeta_1, \eta_1, \rho_2, \delta_1) = (0.1,0.4)$

If i =1,2,3,4 and $\kappa = 3$ then :

$\#\mathcal{Mfs}^3$		$(\mathcal{E}_1 \times \mathcal{E}_2)$
		(ζ_1, η_1)
$(\mathcal{E}_3 \times \mathcal{E}_4)$	(ρ_1, δ_1)	$(\zeta_1, \eta_1, \rho_1, \delta_1) = (0.3,0.2,0)$
	(ρ_2, δ_1)	$(\zeta_1, \eta_1, \rho_2, \delta_1) = (1,0.1,0.4)$

5. N-ARY MULTI FUZZY SOFT MATRIX

5.1 Defention

The **n-ary multi fuzzy soft set** is a mapping $\#\mathcal{fs}^{\kappa}: \prod_{i=1}^{n} \mathcal{E}_i \rightarrow I^{\kappa}$; $i = 1, \dots, n$; $\kappa \in \mathcal{N}$ i.e.

$\#\mathcal{fs}^{\kappa}(e_1, \dots, e_n) = ((\mathcal{f}^{\circ}\mathcal{s})(e_1, \dots, e_n))^{\kappa}, \forall e_i \in \mathcal{E}_i$, $i = 1, \dots..n$

then **n-ary multi fuzzy soft matrix** denoted by $\#\mathcal{Mfs}^{\kappa}$ such that:$\#\mathcal{Mfs}^{\kappa}$: $((\prod_{i=1}^{n} \mathcal{E}_i) = (\mathcal{E}_1 \times \dots \times \mathcal{E}_n) \rightarrow I^{\kappa}; i = 1, \dots, n ; \kappa \in \mathcal{N}$

i.e. $$\#\mathcal{Mfs}^{k} = \left\{ \left((e_1, \dots, e_n), (\underbrace{\mathscr{r}_1, \dots, \mathscr{r}_{\kappa}}_{k-time}) \right), \forall e_i \in \mathcal{E}_i \text{ , } \forall \text{ } i = 1, \dots, n, \kappa \in \mathcal{N} \right\}$$

5.2.Example We can explain the definition by the following matrices

If i =1,2 , $\kappa = 2$ then:

$\#\mathcal{Mfs}^{\kappa}$ can be represented by the following table (matrix):

$\#\mathcal{Mfs}^2$	$(\mathcal{E}_1)$
$(\mathcal{E}_2)$	$\#\mathcal{fs}^2(e_1, e_2) = (\mathscr{r}_1, \mathscr{r}_2)$, where $e_1 \in \mathcal{E}_1, e_2 \in \mathcal{E}_2$ and $\mathscr{r}_1, \mathscr{r}_2 \in I$

If i =1,2,3 and κ =2 then :

$\#\mathcal{Mfs}^2$	$(\mathcal{E}_1 \times \mathcal{E}_2)$
$(\mathcal{E}_3)$	$\#\mathcal{fs}^2(e_1, e_2, e_3) = (\mathscr{r}_1, \mathscr{r}_2)$,where$e_1 \in \mathcal{E}_1, e_2 \in \mathcal{E}_2, e_3 \in \mathcal{E}_3$and $\mathscr{r}_1, \mathscr{r}_2 \in I$

If n is even, κ =2 then :

$\#\mathcal{Mfs}^2$	$\left(\mathcal{E}_1 \times \dots \times \mathcal{E}_{\frac{n}{2}}\right)$
$\left(\mathcal{E}_{\frac{n}{2}+1} \times \dots \times \mathcal{E}_n\right)$	$\#\mathcal{fs}(e_1, \dots, e_n) = (\mathscr{r}_1, \mathscr{r}_2)$; $\forall$ $e_i \in \mathcal{E}_i$, $i = 1, \dots..n$, and $\mathscr{r}_1, \mathscr{r}_2 \in I$

If n is odd then , $\kappa = 2$ then :

$\#\mathcal{Mfs}^2$	$\left(\mathcal{E}_1 \times \dots \times \mathcal{E}_{\frac{n+1}{2}}\right)$
$\left(\mathcal{E}_{\frac{n+3}{2}} \times \dots \times \mathcal{E}_n\right)$	$\#\mathcal{fs}^2(e_1, \dots, e_n) = (\mathscr{r}_1, \mathscr{r}_2)$; $\forall e_i \in \mathcal{E}_i$, $i = 1, \dots..n$ and $\mathscr{r}_1, \mathscr{r}_2 \in$ I

If $\kappa > 2$ *then* $\#\mathcal{Mfs}^{\kappa}: \prod_{i=1}^{n} \mathcal{E}_i \rightarrow I^{\kappa}$

$$\#\mathcal{Mfs}^{k} = \left\{ \left((e_1, \dots, e_n), (\underbrace{\mathscr{r}_1, \dots, \mathscr{r}_{\kappa}}_{k-time}) \right), \forall e_i \in \mathcal{E}_i \text{ , } \forall \text{ } i = 1, \dots..n, \kappa \in \mathcal{N} \right\}$$

If n is even, $\kappa > 2$ then:

$\#\mathcal{Mfs}^{\kappa}$	$\left(\mathcal{E}_1 \times \dots \times \mathcal{E}_{\frac{n}{2}}\right)$
$\left(\mathcal{E}_{\frac{n}{2}+1} \times \dots \times \mathcal{E}_n\right)$	$\#\mathcal{fs}^{\kappa}(e_1, \dots, e_n) = (\mathscr{r}_1, \dots, \mathscr{r}_{\kappa})$; where $\forall e_i \in \mathcal{E}_i$, $i = 1, \dots..n$ and $\mathscr{r}_1, \dots, \mathscr{r}_{\kappa} \in I$

If n is odd and $\kappa > 3$ then :

$\#\mathcal{Mfs}^{\kappa}$	$\left(\mathcal{E}_1 \times \dots \times \mathcal{E}_{\frac{n+1}{2}}\right)$
$\left(\mathcal{E}_{\frac{n+3}{2}} \times \dots \times \mathcal{E}_n\right)$	$\#\mathcal{fs}^{\kappa}(e_1, \dots, e_n) = (\mathscr{r}_1, \dots, \mathscr{r}_{\kappa})$; where $\forall e_i \in \mathcal{E}_i$, $i = 1, \dots..n$and $\mathscr{r}_1, \dots, \mathscr{r}_{\kappa} \in I$

5.3.Note we can Denote to n-ary fuzzy soft matrix $\#\mathcal{Mfs}$by the $[a_{uv}]_{\wp \times \Im}$, such that $\wp \times \Im$= the number of $(\prod_{i=1}^{n} \mathcal{E}_i)$. And can be represented by the following :

$$[a_{uv}] = \begin{bmatrix} a_{11} & a_{12} & \dots\dots & a_{1\wp} \\ a_{21} & a_{22} & \cdots\dots & a_{2\wp} \\ \vdots & \vdots & \dots\dots & \vdots \\ a_{\Im 1} & a_{\Im 2} & \dots\dots & a_{\Im\wp} \end{bmatrix}$$

Such that every element in the n-ary fuzzy soft matrix is the value of n-ary fuzzy soft set for every column and row in the matrix . The set of all $\wp \times \Im$n-ary fuzzy soft matrices over X will be denoted by $\#\mathcal{Mfs}_{\wp \times \Im}$.

We use $[a_{uv}]$instead of $[a_{uv}]_{\wp \times \Im}$ since $[a_{uv}] \in \#\mathcal{Mfs}_{\wp \times \Im}$, mean that $[a_{uv}]$ is $\wp \times \Im$ fuzzy soft matrix for $u = 1, \dots, \wp$; $v = 1, \dots, \Im$.

5.4. Example

If we consider the example 3.8to n- ary multi fuzzy soft matrix.

i =1,2,3 and $\kappa = 3$ then

$\#\mathcal{Mfs}^3$		$(\mathcal{E}_1 \times \mathcal{E}_2)$		
		(ζ_1, η_1)	(ζ_1, η_2)	(ζ_1, η_3)
$(\mathcal{E}_3)$	(ρ_1)	(0.2,0,0.6)	(0.1,0,0.4)	(0.3,0.5,0.7)
	(ρ_2)	(1,0.8,0.6)	(0.9,0.6,1)	(0.2,0.4.0.8)

The above n- ary multi fuzzy soft matrix can be represented by the following shape:

$$[a_{uv}] = [a_{2\times3}] = \begin{bmatrix} (0.2,0,0.6) & (0.1,0,0.4) & (0.3,0.5,0.7) \\ (1,0.8,0.6) & (0.9,0.6,1) & (0.2,0.4.0.8) \end{bmatrix}$$

5.5Definition

Let $[a_{uv}] \in \#\mathcal{Mfs}_{\wp \times \Im}$ then $[a_{uv}]$ is called :

1) N –Ary zero fuzzy soft matrix, denoted by $[a_{uv}] = 0$, if $a_{uv} = 0$ for all u, v

2)N –Ary universal fuzzy soft matrix, denoted by $[a_{uv}] = 1$, if$a_{uv} = 1$ for all u, v.

5.6 Definition

Let $[a_{uv}], [b_{uv}] \in \#\mathcal{Mfs}_{\wp \times \Im}$. Then :

1)$[a_{uv}]$is n-ary fuzzy soft submatrix of $[b_{uv}]$, denoted by $[a_{uv}] \tilde{\subseteq} [b_{uv}]$ if $a_{uv} \lesssim b_{uv}$for all u, v
2)$[a_{uv}]$is n-ary fuzzy soft proper matrix of $[b_{uv}]$, denoted by$[a_{uv}] \tilde{\subseteq} [b_{uv}]$ if $a_{uv} \lesssim b_{uv}$for all u, v.
3)$[a_{uv}]$is n-ary fuzzy soft equal matrix of $[b_{uv}]$, denoted by $[a_{uv}] = [b_{uv}]$ if $a_{uv} = b_{uv}$for all u, v.

5.7Defintion

let $[a_{uv}], [b_{uv}] \in \#\mathcal{M}fs_{\wp\times\Im}$ then the n-ary fuzzy soft matrix $[c_{uv}]$ is called:
1) Union of $[a_{uv}]$ and $[b_{uv}]$, denoeted $[a_{uv}] \cup [b_{uv}]$ if ; c_{uv}= max $\{a_{uv}, b_{uv}\}$, for all u, v.
2) Intersection of $[a_{uv}]$ and $[b_{uv}]$, denoeted $[a_{uv}] \cap [b_{uv}]$ if ;c_{uv}= min $\{a_{uv}, b_{uv}\}$, for all u and v.
3) The complement of $[a_{uv}]$, denoted by $[a_{uv}]^c$ if ; $c_{uv} = 1 - a_{uv}$, for all u and v.

5.8 Definition

let $[a_{uv}]$ and $[b_{uv}] \in \#\mathcal{M}fs_{\wp\times\Im}$, then $[a_{uv}]$ and $[b_{uv}]$ are disjoint, if $[a_{uv}] \cap [b_{uv}] = [0]$, for all u and v.

3. Product of n-ary fuzzy soft matrix

5.9 Defintion

let $[a_{uv}], [b_{u\mathcal{L}}] \in \#\mathcal{M}fs_{\wp\times\Im}$, then AND – product of $[a_{uv}]$ and $[b_{u\mathcal{L}}]$ is defined by $\wedge: \#\mathcal{M}fs_{\wp\times\Im} \times \#\mathcal{M}fs_{\wp\times\Im} \to \#\mathcal{M}fs_{\wp\times\Im^2}$, $[a_{uv}] \wedge [b_{u\mathcal{L}}]$=$[c_{u\varkappa}]$, where $c_{u\varkappa} = \min\{a_{uv}, b_{u\mathcal{L}}\}$ such that $\varkappa = \wp(v-1) + \mathcal{L}$.

5.10 Defintion

let $[a_{uv}], [b_{u\mathcal{L}}] \in \#\mathcal{M}fs_{\wp\times\Im}$, then OR – product of $[a_{uv}]$ and $[b_{u\mathcal{L}}]$is defined by $\vee: \#\mathcal{M}fs_{\wp\times\Im} \times \#\mathcal{M}fs_{\wp\times\Im} \to \#\mathcal{M}fs_{\wp\times\Im^2}$, $[a_{uv}]\vee[b_{u\mathcal{L}}]$=$[c_{u\varkappa}]$ where$c_{u\varkappa} = \max\{a_{uv}, b_{u\mathcal{L}}\}$ such that $\varkappa = \wp(v-1) + \mathcal{L}$.

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