Application of Fuzzy Soft Graph in Role Model Service Rendered to Orphans

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Abstract : In this paper, We define fuzzy soft graphs and coin their properties by establishing with examples. Finally we extend our concept in application of these graphs in decision making problem.

IndexTerms - Soft set, Fuzzy soft set, Fuzzy soft graph, complement of fuzzy soft graphs, union of fuzzy soft graphs.

I. Introduction

Molodtsov [13] introduced the concept of soft set that can be seen as a new mathematical theory for dealing with uncertainties, Molodtsov applied this theory to several directions [13, 14,15] and then formulated the notions of soft number, soft derivative, soft integral, etc in [16]. The soft set theory has been applied to many different fields with greatness maji [11] worked on theoretical study of soft sets in detail. The algebraic structure of soft set theory dealing with uncertainties has also been studied in more detail. Aktas and Cagman [2] introduced definition of soft groups, and derived their basic properties. The most appreciate theory to deal with uncertainties is the theory of fuzzy sets, developed by Zadeh [22] in 1965.

There after maji and his coauthor [10] introduced the notion of intuitionistic fuzzy soft set which is based on a combination of intuitionistic fuzzy sets and soft set models and they studied the properties of intuitionistic fuzzy soft set.

The first definition of intuitionistic fuzzy graph was introduced by Atanassov [5] in 1999. Karunambigai and parvathy [J] introduced intuitionistic fuzzy graph as a special case of Atanassov'S intuitionistic fuzzy graph. Soft graph was introduced by Thumbakara and George [18] in 2015. Mohinta and samanta [20] introduced the concept of fuzzy soft graph.

In this paper, our aim is to introduce the notion of fuzzy soft graph in decision making problem which will yield fruitful result in this field.

II. Preliminaries

In this section, we recall some basic essential notion of fuzzy soft set theory.

Definition 2.1

Let U be an initial universe set and E be a set of parameters. Let P (U) denotes the **power set** of U. Let A⊆E. A pair$(\widetilde{F_A}\,, E)$ is called a **soft set** over U, where F_A is a mapping given by F_A : E→ P(U) such that F_A (e) = φ.Here F_A is called approximate function of the soft set (F_A, E).The set F_A (e) is called e-approximate value set which consist of related objects of the parameter e∈ E. In other words, a soft set over U is a parameterized family of subsets of the universe U.

Example 2.1 :

Let U= {u_1, u_2, u_3, u_4} be a set of four types of silk sarees and E = { Banaras(e_1),Aarani(e_2),Kanchipuram(e_3)} be a set of parameters. If A={ e_2, e_3}⊆ E. Let F_A (e_2) = { u_1, u_2, u_4} and F_A (e_3)= { u_1, u_3, u_4} then we write the soft set (F_A, E) = { (e_2,{ u_1, u_2, u_4}), (e_3, (u_1, u_3, u_4))} over U which describe the " Variety of silk sarees " which Mr.Z is going to buy. we may represent the soft set in the following form:

U	Banaras (e_1)	Aarani (e_2)	Kanchipuram(e_3)
u_1	0	1	1
u_2	0	1	0
u_3	0	0	1
u_4	0	1	1

Table 2.1.1

Definition 2.2

Let U be an initial universe set and E be a set of parameters. Let A ⊆ E. A pair $(\widetilde{F_A}\,, E)$ is called a **fuzzy soft set** over U, where $\widetilde{F_A}$ is a mapping given by $\widetilde{F_A}$: E → I^U, where I^U denotes the collection of all **fuzzy subsets** of U.

Example 2.2

Consider the example 2.1., here we cannot express with only two real numbers 0 and 1, We can characterized it by a membership function instead of crisp number 0 and 1 which associate with each element a real number in the interval [0,1] then

$(\widetilde{F_A}, E)$ ={$\widetilde{F_A}$ (e_2) = { (u_1, 0.5), (u_2, 0.3), (u_3,0.7), (u_4,0.6)}, $\widetilde{F_A}$ (e_3) = { (u_1, 0.4), (u_3,0.8), (u_4,0.9)}} is the fuzzy soft set representing the "Variety of silk sarees" which Mr.Z is going to buy. We may represent the fuzzy soft set in the following form:

U	Banaras (e_1)	Aarani (e_2)	Kanchipuram (e_3)
u_1	0.0	0.5	0.4
u_2	0.0	0.3	0.0
u_3	0.0	0.7	0.8
u_4	0.0	0.6	0.9

Table 2.2.2

Definition 2.3

Let U be an initial universe set and E be the set of attributes. Then the pair (U,E) denotes the collection of all fuzzy soft sets on U with attributes from E and is called a fuzzy soft class.

Definition 2.4

For two fuzzy soft sets $(\widetilde{F_A}, E)$ and $(\widetilde{G_B}, E)$ over a common universe U, we have $(\widetilde{F_A}, E) \subseteq (\widetilde{G_B}, E)$ if A⊂B and e∈ A, $\widetilde{F_A}$ (e) is a **fuzzy subset** of $\widetilde{G_B}$ (e).i.e., $(\widetilde{F_A}, E)$ is a fuzzy soft subset of $(\widetilde{G_B}, E)$.

Definition 2.5

The **Complement of fuzzy soft set** $(\widetilde{F_A}, E)$ denoted by $(\widetilde{F_A}, E)^0$ is denoted by $(\widetilde{F_A}, E)^0 = (F_A^0, E)$ where $\widetilde{F_A}^0 : E \rightarrow I^U$ is a mapping given by $\widetilde{F_A}^0(e) = [\widetilde{F_A}(e)]^0$, for all e∈ E.

Definition 2.6

A fuzzy Soft set $(\widetilde{F_A}, E)$ over U is said to be **null fuzzy soft set** with respect to the parameter set E, denoted by $\overline{\emptyset}$, if $\widetilde{F_A}$ (e) $=\overline{\emptyset}$, for all e∈ E.

III. Fuzzy Soft Graphs Theory

Definition 3.1 A **fuzzy soft graph** $\tilde{G} = (G^*, \tilde{F}, \tilde{K}, A)$ is a 4-tuple such that

(a) $G^* = (V,E)$ is a simple graph,

(b) A is a nonempty set of Parameters,

(c) $(\tilde{F}, A)$ is a Fuzzy soft set over V,

(d) $(\tilde{K}, A)$ is a fuzzy soft set over E,

(e) $(\tilde{F}(a), \tilde{K}(a))$ is a fuzzy (sub) graph of G^* for all a ∈ A and x, y∈V. That is $\tilde{K}(a)(xy) \leq \min\{\tilde{F}(a)(x), \tilde{F}(a)(y)\}$ for all a∈ A and x,y ∈ V. The fuzzy graph $((\tilde{F}(a), \tilde{K}(a))$ is denoted by $\tilde{H}(a)$ for convenience. On the other hand, a fuzzy soft graph is a parameterized family of fuzzy graphs. The class of all fuzzy soft graphs of G^* is denoted by $F(G^*)$.

Example 3.1

Consider a simple graph $G^* = (V, E)$ such that $V = \{a_1, a_2, a_3\}$ and $E = \{a_1 a_2, a_2 a_3, a_3 a_1\}$. Let $A = \{e_1, e_2, e_3\}$ be a parameter set and $(\tilde{F}, A)$ be a fuzzy soft set over V with its fuzzy approximate function $\tilde{F} : A \rightarrow P(V)$ defined by

$\tilde{F}(e_1) = \{a_1|0.1, a_2|0.6, a_3|0.8\}$,
$\tilde{F}(e_2) = \{a_1|0.1, a_2|0.3, a_3|0.7\}$,
$\tilde{F}(e_3) = \{a_1|0.4, a_2|0.5, a_3|0.9\}$.

Let $(\tilde{K}, A)$ be a fuzzy soft set over E with its fuzzy approximate function $\tilde{K} : A \quad P(E)$ defined by

$\tilde{K}(e_1) = \{a_1 a_2|0.1, a_2 a_3|0.2, a_3 a_1|0.1$
$\tilde{K}(e_2) = \{a_1 a_2|0.1, a_2 a_3|0.2, a_3 a_1|0.1\}$,
$\tilde{K}(e_3) = \{a_1 a_2|0.4, a_2 a_3|0.4, a_3 a_1|0.3\}$. Thus $\tilde{H}(e_1) = (\tilde{F}(e_1), \tilde{K}(e_1))$, $\tilde{H}(e_2) = (\tilde{F}(e_2), \tilde{K}(e_2))$, $\tilde{H}(e_3) = (\tilde{F}(e_3), \tilde{K}(e_3))$, are fuzzy graphs of G^* as shown in figure 1. It is easy to verify that $\tilde{G} = (G^*, \tilde{F}, \tilde{K}, A)$ is a fuzzy soft graph.

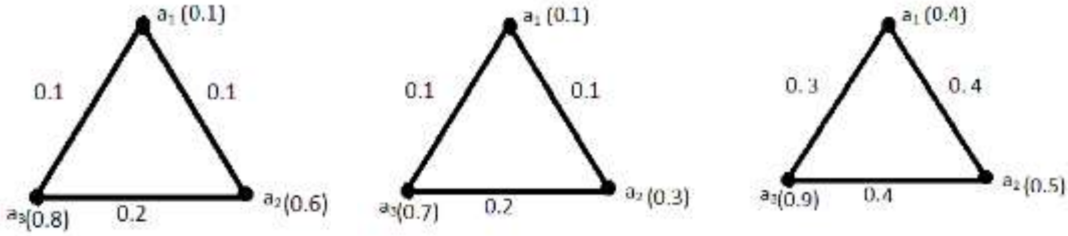


Figure 3.1 Fuzzy Subgraphs

Definition 3.2

The difference of membership function and non membership function is called **membership value of fuzzy soft graph.**

Definition 3.3

A fuzzy soft graph G is self complementary if G≈G¹ where G¹ is the **complement of fuzzy soft graph** G.

Definition 3.4

Let V_1, V_2 ⊂ V and A, B ⊂ E, then **union of two fuzzy soft graph** $\tilde{G}_{A,V_2}{}^1$= (F̃(a), K̃ (a)) and $\tilde{G}_{B,V_2}{}^2$=(F̃(b), K̃ (b)) is defined to be $\tilde{G}_{C,V_3}{}^3$=(F̃(c), K̃ (c)) where C=A∪ B, V_3= V_1∪ V_2

Definition 3.5

Let A,B ∈ FSG.Let the corresponding membership value graph denoted by MV(F_A) and MV(G_B) Then the **score graph** $S_{(F_A,G_B)}$ would be defined as $S_{(F_A,G_B)}$ = MV(F_A) - MV(G_B)

Definition 3.6

Let A, B ∈ FSG. Let the Corresponding membership value graphs be MV (A) and MV (B) and the score graph be $S_{(F_A,G_B)}$ = MV (F_A) - MV (G_B) then the **total score graph** would be calculated by the formula

S_i= Summation of (MV (F_A) - MV (G_B)).

IV. Methodology

Suppose U is the set of certain number of orphanages. E is a set of parameters related to highest service rendered to orphans by the orphanages. we construct a fuzzy soft graph (F_A,E) over U representing the best service hospitality and showed by the orphanages where F_A is a mapping F_A:E→I^U, I^U is the set of all fuzzy subset of U. we further construct another fuzzy soft set (F_B,E) over U denoting the best hospitality and need of service focus to the orphans by the organization.The fuzzy soft graphs ($\widetilde{F_A}$, E) and ($\widetilde{F_B}$, E) are constructed .we compute the complement ($\widetilde{F_A}$, E)^0 and ($\widetilde{F_B}$ E)^0 and using definition 3.1 we compute $\widetilde{F_A}$ ∪ $\widetilde{F_B}$ which represents the maximum membership of best service and hospitality rendred to the orphans by the orphanages and then compute $\widetilde{F_A}^0$ ∪ $\widetilde{F_B}^0$ which represented the maximum membership of less service showed to the orphan by the orphanages using definition we compute membership value of $\widetilde{F_A}$ ∪ $\widetilde{F_B}$ and membership value of $\widetilde{F_A}^0$ ∪ $\widetilde{F_B}^0$ .The score graph $S_{\widetilde{F_A} \cup \widetilde{F_B}, \widetilde{F_A}^0 \cup \widetilde{F_B}^0}$ is constructed. Using definition 3.5 and the total score S_i for each u_i in U is calculated using definition 3.6. Finally, we would find S_K = max_i (S_i) then we conclude that orphanages u_k has the maximum service rendered between the orphanages. If S_k has more than one value the process is repeated by reassessing the parameters for choosing the role model organization.

Algorithm

Step 1: obtain the intuitionistic fuzzy soft graphs $\tilde{F}_{A,V}{}^1$ and $\tilde{F}_{B,V}{}^2$

Step 2: Write the fuzzy soft graphs ($\tilde{F}_{A,V}{}^1$, E)^0 and ($\tilde{F}_{B,V}{}^2$, E)^0

Step 3: Compute ($\tilde{F}_{A,V}{}^1$) ∪ ($\tilde{F}_{B,V}{}^2$) and MV ($\tilde{F}_{A,V}{}^1$) ∪ ($\tilde{F}_{B,V}{}^2$)

Step 4: Compute $(\tilde{F}_{A,V}{}^1)^0$ ∪ $(\tilde{F}_{B,V}{}^2)^0$ and MV $(\tilde{F}_{A,V}{}^1)^0$ ∪ $(\tilde{F}_{B,V}{}^2)^0$

Step 5: compute the score graph $S_{(\tilde{F}_{A,V}{}^1) \cup (\tilde{F}_{B,V}{}^2), (\tilde{F}_{A,V}{}^{1})^0 \cup (\tilde{F}_{B,V}{}^{2})^0}$

Step 6: Compute the total score S_i for each u_i in U.

Step 7 : Find S_k =$max_i S_i$, then we conclude that the multifarious service rendered by orphanage u_k has the maximum score value between the orphanages.

Step 8: If S_k has more than one value, then go to step (1) and repeat the process by reassessing the parameters with regard to the nature of service.

V. Results and Discussion

Let ($\widetilde{F_A}^1$, E) and ($\widetilde{F_B}^2$, E) be two fuzzy soft graph represending the orphanages has the maximum score value between the four orphanages U = { u_1,u_2,u_3,u_4} respectively.

step 1 : Let us consider E={ e_1,e_2,e_3,e_4} as a set of parameter for choosing the service rendered to orphans by the orphanages.

e_1 is the orphanage having only physically handicapped people.

e_2 is the orphanage having only Mentally disorder people

e_3 is the orphanage having only old aged people.

e_4 is the orphanage having only Orphan children.

Consider a simple graph G* =(V,E) such that V= $\{x_1, x_2, x_3, x_4\}$ and E= $\{x_1x_2, x_2x_3, x_3x_4, x_2x_4\}$ .Let A= {e_1,e_2,e_3} ,B={e_1,e_3,e_4} be the subset of the parameter set and ($\tilde{F}_{P,\gamma}{}^1$(e_i),A) , ($\tilde{F}_{P,\gamma}{}^2$(e_j),B) be a intuitionistic fuzzy soft set over V with intuitionistic fuzzy approximate function $\tilde{F}_{P,\gamma}{}^1$: A→ I $F_1{}^V$ and $\tilde{F}_{P,\gamma}{}^2$: B→I $F_2{}^V$

$\tilde{F}_{P,\gamma}{}^{1}(e_1) = \{ x_1/(0.3,0.6), x_2/(0.7,0.2), x_3/(0.7,0.2), x_4/(0,0.6)\}$

$\tilde{F}_{P,\gamma}{}^{1}(e_2) = \{ x_1/(0.1,0.8), x_2/(0.5,0.4), x_3/(0.8,0.2), x_4/(0.2,0.7)\}$

$\tilde{F}_{P,\gamma}{}^{1}(e_3) = \{ x_1/(0.9,0.6), x_2/(0.4,0.9), x_3/(0.6,0.8), x_4/(0.9,0.5)\}$ and

$\tilde{F}_{P,\gamma}{}^{2}(e_1) = \{ x_1/(0.6,0.3), x_2/(0.4,0.6), x_3/(0.5,0.4), x_4/(0,0.7)\}$

$\tilde{F}_{P,\gamma}{}^{2}(e_3) = \{ x_1/(0.9,0.4), x_2/(0.5,0.8), x_3/(0.4,0.9), x_4/(0.9,0.5)\}$

$\tilde{F}_{P,\gamma}{}^{2}(e_4) = \{ x_1/(0,0.6), x_2/(0.7,0.2), x_3/(0.5,0.4), x_4/(0.4,0.6)\}$

Then ($\tilde{K}_{V,\tau}{}^{1}(e_i)$,A) and ($\tilde{K}_{V,\tau}{}^{2}(e_j)$,B) are intuitionistic fuzzy soft set over E such that

$\tilde{K}_{V,\tau}{}^{1}(e_1) = \{x_1x_2/(0.2,0.6), x_2x_3/(0.5,0.2), x_3x_4/(0,0.6)\}$

$\tilde{K}_{V,\tau}{}^{1}(e_2) = \{x_1x_2/(0.1,0.7), x_2x_3/(0.4,0.4), x_3x_4/(0.1,0.6)\}$

$\tilde{K}_{V,\tau}{}^{1}(e_3) = \{x_1x_2/(0.4,0.9), x_2x_3/(0.4,0.9), x_3x_4/(0.4,0.7)\}$

$\tilde{K}_{V,\tau}{}^{2}(e_1) = \{x_1x_2/(0.4,0.6), x_2x_3/(0.3,0.5), x_2x_4/(0,0.7)\}$

$\tilde{K}_{V,\tau}{}^{2}(e_3) = \{x_1x_2/(0.4,0.9), x_2x_3/(0.4,0.9), x_2x_4/(0.8,0.4)\}$

$\tilde{K}_{V,\tau}{}^{2}(e_4) = \{x_1x_2/(0,0.6), x_2x_3/(0.4,0.3), x_2x_4/(0.3,0.5)\}$

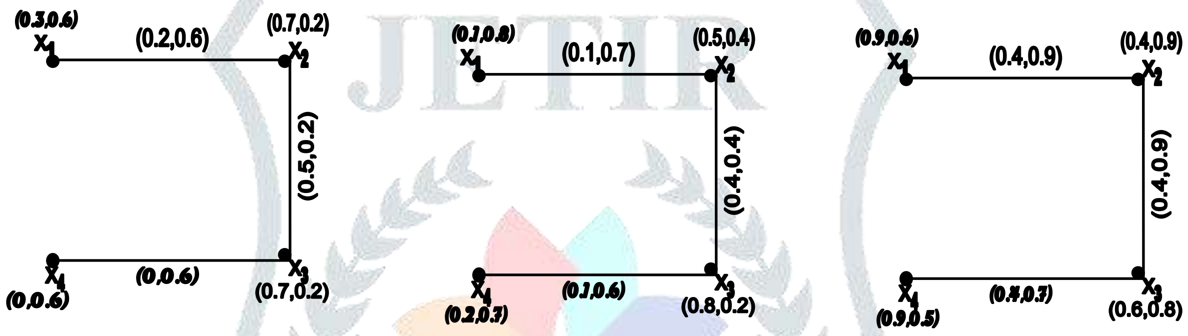


Figure 1

$\tilde{G}_{C,V_1}{}^{1} = (\tilde{F}_{e,\gamma}{}^{1}(e_i), \tilde{K}_{V,\tau}{}^{1}(e_i))$

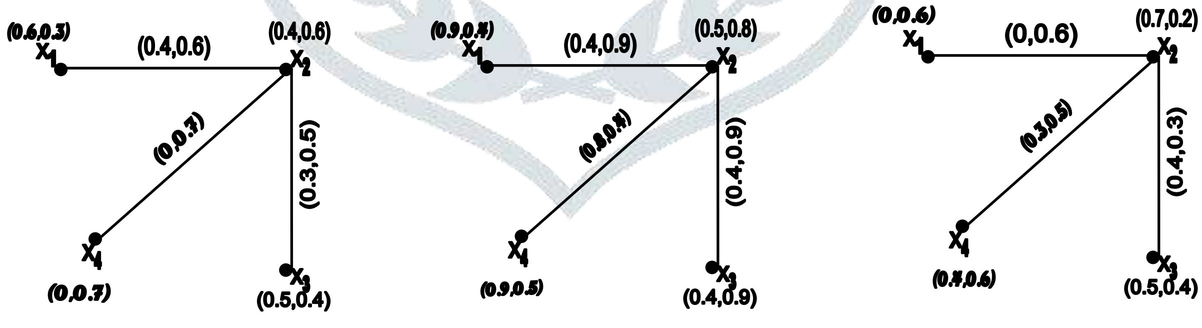


Figure 2

$\tilde{G}_{C,V_2}{}^{2} = (\tilde{F}_{P,\gamma}{}^{2}(e_i), \tilde{K}_{V,\tau}{}^{2}(e_i))$

Then the union of two intuitionistic fuzzy soft graph is $\tilde{G}_{C,V_3}{}^{3} = (\tilde{F}_{P,\gamma}{}^{3}(e_i), \tilde{K}_{V,\tau}{}^{3}(e_i))$

$\tilde{F}_{P,\gamma}{}^{3}(e_1)=\{x_1/(0.6,0.3), x_2/(0.7,0.2), x_3/(0.7,0.2), x_4/(0,0.6)\}$

$\tilde{F}_{P,\gamma}{}^{3}(e_2)=\{x_1/(0.1,0.8), x_2/(0.5,0.4), x_3/(0.8,0.2), x_4/(0.2,0.7)\}$

$\tilde{F}_{P,\gamma}{}^{3}(e_3)=\{x_1/(0.9,0.4), x_2/(0.5,0.8), x_3/(0.6,0.9), x_4/(0.9,0.5)\}$

$\tilde{F}_{P,\gamma}{}^{3}(e_4)=\{x_1/(0,0.6), x_2/(0.7,0.2), x_3/(0.5,0.4), x_4/(0.4,0.6)\}$

$\tilde{K}_{V,\tau}{}^{3}(e_1)=\{x_1x_2/(0.4,0.6), x_2x_3/(0.5,0.2), x_3x_4/(0,0.6), x_2x_4/(0,0.7)\}$

$$\widetilde{K}_{V,\tau}^{\;3}(e_2)=\{x_1\,x_2/(0.1,0.7),\, x_2\,x_3/(0.4,0.4),\, x_3\,x_4/(0.1,0.6),\, x_2\,x_4/(0,1)\}$$
$$\widetilde{K}_{V,\tau}^{\;3}(e_3)=\{x_1\,x_2/(0.9,0.4),\, x_2\,x_3/(0.4,0.9),\, x_2\,x_4/(0.8,0.4),\, x_3\,x_4/(0.1,0.6)\}$$
$$\widetilde{K}_{V,\tau}^{\;3}(e_4)=\{x_1\,x_2/(0,0.6),\, x_2\,x_3/(0.4,0.3),\, x_3\,x_4/(0,1),\, x_2\,x_4/(0.3,0.5)\}$$

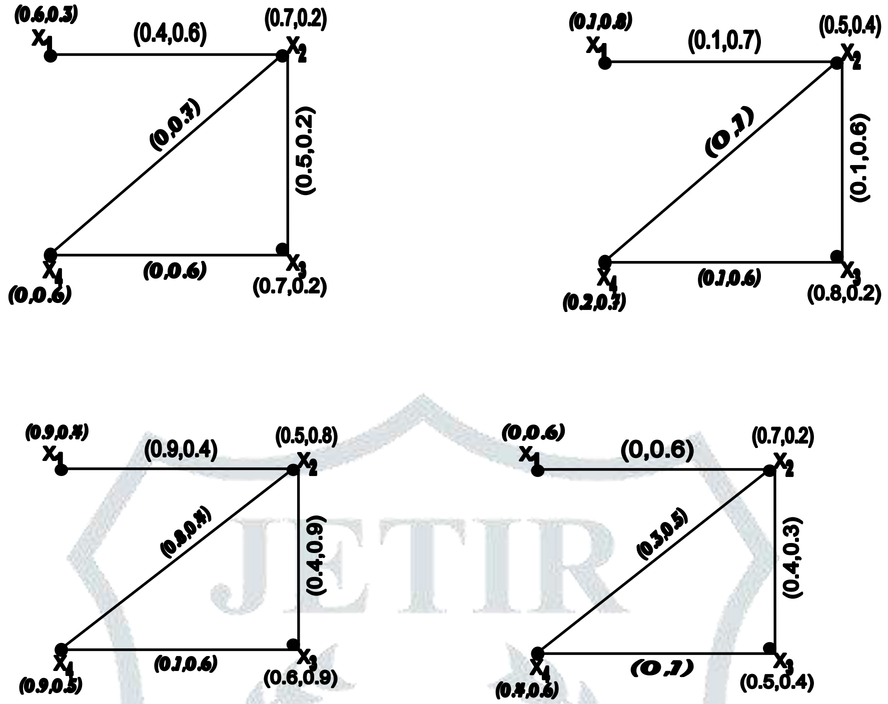


Figure 3

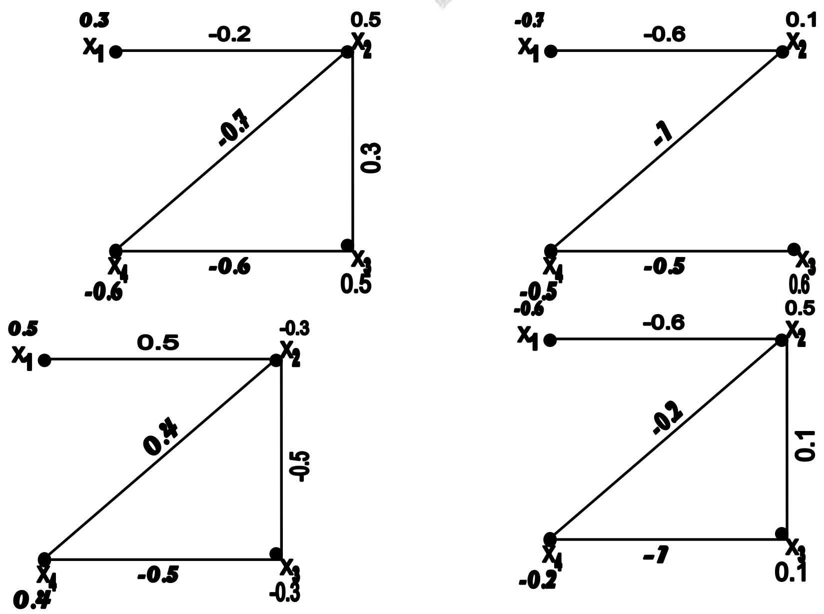
$$\widetilde{G}_{C,V_3}^{\;3} = (\widetilde{F}_{P,\gamma}^{\;3}(e_i), \widetilde{K}_{V,\tau}^{\;3}(e_i))$$

Next to find $V(\widetilde{G}_{C,V}^{\;3}) = (V(\widetilde{F}_{P,\gamma}^{\;3}(e_i)), V(\widetilde{K}_{V,\tau}^{\;3}(e_i)))$

$$V(\widetilde{F}_{P,\gamma}^{\;3}(e_1)) = \{x_1/0.3,\, x_2/0.5,\, x_3/0.5,\, x_4/-0.6\}$$
$$V(\widetilde{F}_{P,\gamma}^{\;3}(e_2)) = \{x_1/-0.7,\, x_2/0.1,\, x_3/0.6,\, x_4/-0.5\}$$
$$V(\widetilde{F}_{P,\gamma}^{\;3}(e_3)) = \{x_1/0.5,\, x_2/-0.3,\, x_3/-0.3,\, x_4/0.4\}$$
$$V(\widetilde{F}_{P,\gamma}^{\;3}(e_4)) = \{x_1/-0.6,\, x_2/0.5,\, x_3/0.1,\, x_4/-0.2\}$$

and

$$V(\widetilde{K}_{V,\tau}^{\;3}(e_1)) = \{x_1\,x_2/-0.2,\, x_2\,x_3/0.3,\, x_3\,x_4/-0.6,\, x_2\,x_4/-0.7\}$$
$$V(\widetilde{K}_{V,\tau}^{\;3}(e_2)) = \{x_1\,x_2/-0.6,\, x_2\,x_3/0,\, x_3\,x_4/-0.5,\, x_2\,x_4/-1\}$$
$$V(\widetilde{K}_{V,\tau}^{\;3}(e_3)) = \{x_1\,x_2/0.5,\, x_2\,x_3/-0.5,\, x_3\,x_4/0.4,\, x_2\,x_4/-0.5\}$$
$$V(\widetilde{K}_{V,\tau}^{\;3}(e_4)) = \{x_1\,x_2/-0.6,\, x_2\,x_3/0.1,\, x_3\,x_4/-1,\, x_2\,x_4/-0.2\}$$



(Figure 4)

$$V(\widetilde{G}_{C,V}{}^{3}) = (V(\widetilde{F}_{P,\gamma}{}^{3}(e_i)), V(\widetilde{K}_{V,\tau}{}^{3}(e_i)))$$

Then the complement of the intuitionistic fuzzy soft graph are

$$\widetilde{F}_{P,\gamma}{}^{1^C}(e_1) = \{x_1/(0.6,0.3), x_2/(0.2,0.7), x_3/(0.2,0.7), x_4/(0.6,0)\}$$

$$\widetilde{F}_{P,\gamma}{}^{1^C}(e_2)=\{x_1/(0.8,0.1), x_2/(0.4,0.5), x_3/(0.2,0.8), x_4/(0.7,0.2)\}$$

$$\widetilde{F}_{P,\gamma}{}^{1^C}(e_3)=\{x_1/(0.6, 0.9), x_2/(0.9,0.4), x_3/(0.8,0.6), x_4/(0.5,0.9)\} \text{ and}$$

$$\widetilde{F}_{P,\gamma}{}^{2^C}(e_1) = \{x_1/(0.3, 0.6), x_2/(0.6,0.4), x_3/(0.4,0.5), x_4/(0.7,0)\}$$

$$\widetilde{F}_{P,\gamma}{}^{2^C}(e_3) = \{x_1/(0.4, 0.9), x_2/(0.8,0.5), x_3/(0.9,0.4), x_4/(0.5,0.9)\}$$

$$\widetilde{F}_{P,\gamma}{}^{2^C}(e_4) = \{x_1/(0.6, 0), x_2/(0.2,0.7), x_3/(0.4,0.5), x_4/(0.6,0.4)\}$$

Then $(\widetilde{K}_{V,\tau}{}^{1^C}(e_i),A)$ and $(\widetilde{K}_{V,\tau}{}^{2^C}(e_i),B)$ are intuitionistic fuzzy soft set over E such that

$$\widetilde{K}_{V,\tau}{}^{1^C}(e_1) =\{x_1 x_2/(0.6,0.2), x_2 x_3/(0.2,0.5), x_3 x_4/(0.6,0)\}$$

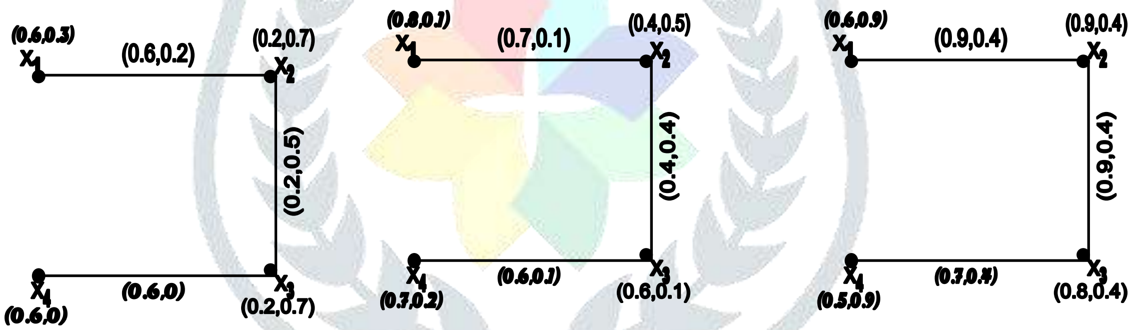
$$\widetilde{K}_{V,\tau}{}^{1^C}(e_2) =\{x_1 x_2/(0.7,0.1), x_2 x_3/(0.4,0.4), x_3 x_4/(0.6,0.1)\}$$

$$\widetilde{K}_{V,\tau}{}^{1^C}(e_3) =\{x_1 x_2/(0.9,0.4), x_2 x_3/(0.9,0.4), x_3 x_4/(0.7,0.4)\}$$

$$\widetilde{K}_{V,\tau}{}^{2^C}(e_1) = \{x_1 x_2/(0.6,0.4), x_2 x_3/(0.5,0.3), x_4 x_2/(0.7,0)\}$$

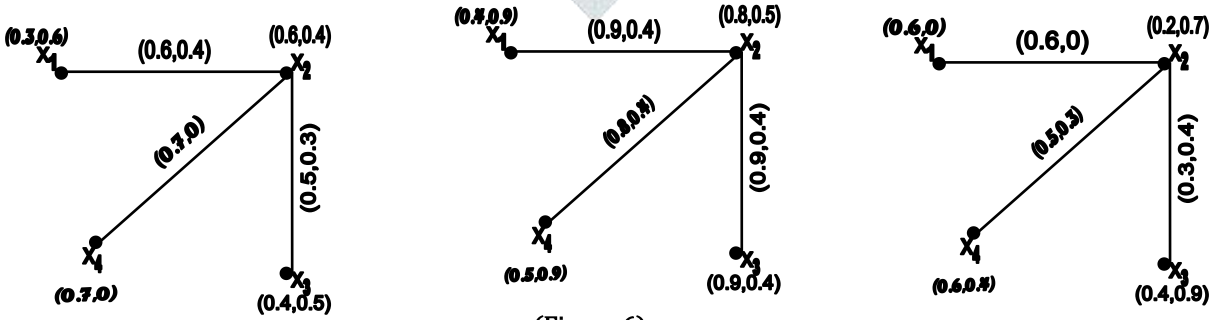
$$\widetilde{K}_{V,\tau}{}^{2^C}(e_3) = \{x_1 x_2/(0.9,0.4), x_2 x_3/(0.9,0.4), x_2 x_4/(0.8,0.4)\}$$

$$\widetilde{K}_{V,\tau}{}^{2^C}(e_4) = \{x_1 x_2/(0.6,0), x_2 x_3/(0.3,0.4), x_2 x_4/(0.5,0.3)\}$$



(Figure 5)

$$\widetilde{G}_{C,V}{}^{1^C} = (\widetilde{F}_{P,\gamma}{}^{1^C}(e_i), \widetilde{K}_{V,\tau}{}^{1^C}(e_i))$$



(Figure 6)

$$\widetilde{G}_{C,V}{}^{2^C} = (\widetilde{F}_{P,\gamma}{}^{2^C}(e_i), \widetilde{K}_{V,\tau}{}^{2^C}(e_i))$$

Then the union of the above two intuitionistic fuzzy soft set graph is $\widetilde{G}_{C,V}{}^{3^C} = (\widetilde{F}_{P,\gamma}{}^{3^C}(e_i), \widetilde{K}_{V,\tau}{}^{3^C}(e_j))$

$$\widetilde{F}_{P,\gamma}{}^{3^C}(e_1) = \{x_1/(0.6,0.3), x_2/(0.6,0.4), x_3/(0.4,0.5), x_4/(0.7,0)\}$$

$$\widetilde{F}_{P,\gamma}{}^{3^C}(e_2) = \{x_1/(0.8,0.1), x_2/(0.4,0.5), x_3/(0.2,0.8), x_4/(0.7,0.2)\}$$

$$\tilde{F}_{P,\gamma}^{3^C}(e_3) = \{x_1/(0.6,0.9), x_2/(0.8,0.5), x_3/(0.9,0.4), x_4/(0.5,0.9)\}$$

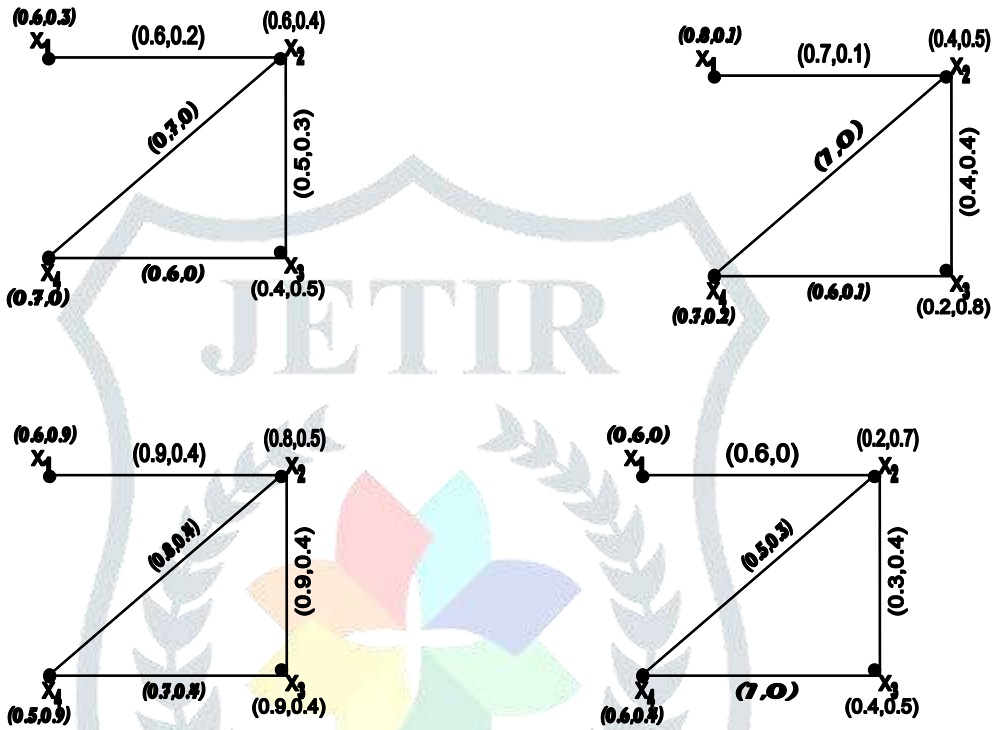
$$\tilde{F}_{P,\gamma}^{3^C}(e_4) = \{x_1/(0.6,0), x_2/(0.2,0.7), x_3/(0.4,0.5), x_4/(0.6,0.4)\}$$

$$\tilde{K}_{V,\tau}^{3^C}(e_1) = \{x_1x_2/(0.6,0.2), x_2x_3/(0.5,0.3), x_4x_2/(0.7,0), x_3x_4/(0.6,0)\}$$

$$\tilde{K}_{V,\tau}^{3^C}(e_2) = \{x_1x_2/(0.7,0.1), x_2x_3/(0.4,0.4), x_3x_4/(0.6,0.1), x_2x_4/(1,0)\}$$

$$\tilde{K}_{V,\tau}^{3^C}(e_3) = \{x_1x_2/(0.9,0.4), x_2x_3/(0.9,0.4), x_3x_4/(0.7,0.4), x_2x_4/(0.8,0.4)\}$$

$$\tilde{K}_{V,\tau}^{3^C}(e_4) = \{x_1x_2/(0.6,0), x_2x_3/(0.3,0.4), x_3x_4/(0.5,0.3), x_3x_4/(1,0)\}$$



(Figure 7)

$$\tilde{G}_{C,V}^{3^C} = (\tilde{F}_{P,\gamma}^{3^C}(e_i), \tilde{K}_{V,\tau}^{3^C}(e_i))$$

Next to find $V(\tilde{G}_{C,V}^{3^C}) = \{V(\tilde{F}_{P,\gamma}^{3^C}(e_i)), (\tilde{K}_{V,\tau}^{3^C}(e_i))\}$

$$V(\tilde{F}_{P,\gamma}^{3^C}(e_1)) = \{x_1/0.3, x_2/0.2, x_3/\text{-}0.1, x_4/0.7\}$$

$$V(\tilde{F}_{P,\gamma}^{3^C}(e_2)) = \{x_1/0.7, x_2/\text{-}0.1, x_3/\text{-}0.6, x_4/0.5\}$$

$$V(\tilde{F}_{P,\gamma}^{3^C}(e_3)) = \{x_1/\text{-}0.3, x_2/0.3, x_3/0.5, x_4/\text{-}0.4\}$$

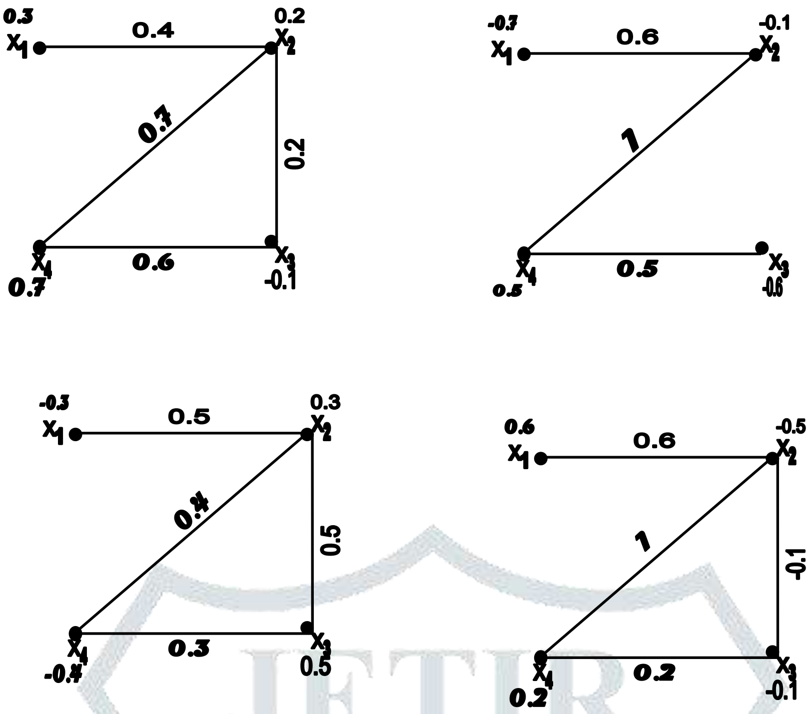
$$V(\tilde{F}_{P,\gamma}^{3^C}(e_4)) = \{x_1/0.6, x_2/\text{-}0.5, x_3/\text{-}0.1, x_4/0.2\}$$

$$V(\tilde{K}_{V,\tau}^{3^C}(e_1)) = \{x_1x_2/0.4, x_2x_3/0.2, x_4x_2/0.7, x_3x_4/0.6\}$$

$$V(\tilde{K}_{V,\tau}^{3^C}(e_2)) = \{x_1x_2/0.6, x_2x_3/0, x_3x_4/0.5, x_2x_4/1\}$$

$$V(\tilde{K}_{V,\tau}^{3^C}(e_3)) = \{x_1x_2/0.5, x_2x_3/0.5, x_3x_4/0.3, x_2x_4/0.4\}$$

$$V(\tilde{K}_{V,\tau}^{3^C}(e_4)) = \{x_1x_2/0.6, x_2x_3/\text{-}0.1, x_2x_4/0.2, x_3x_4/1\}$$

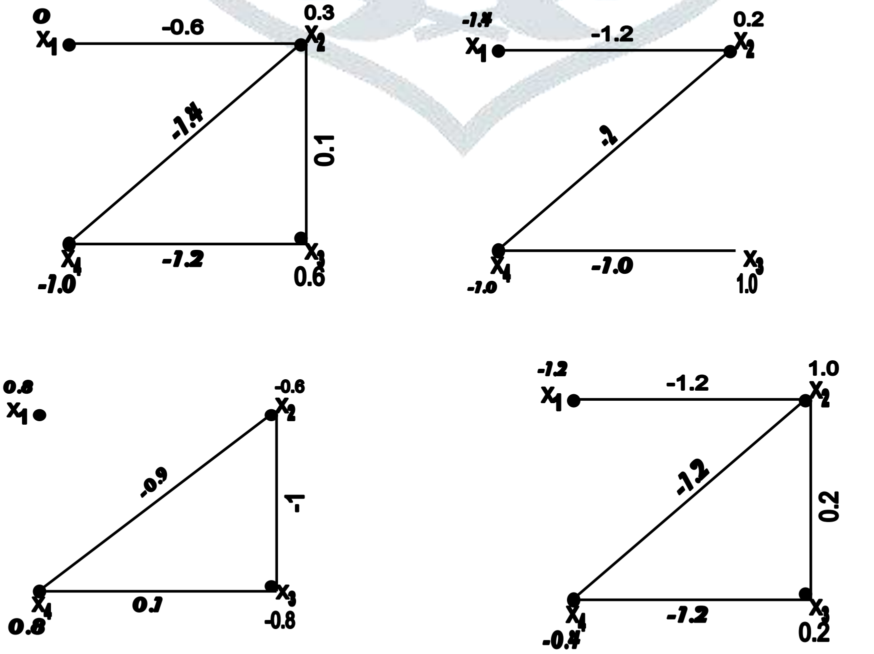


(Figure 8)

$$V(\widetilde{G}_{C,V}{}^{3^C}) = \{V(\widetilde{F}_{P,\gamma}{}^{3^C}(e_i)), V(\widetilde{K}_{V,\tau}{}^{3^C}(e_i))\}$$

Next to find $V(\widetilde{F}_{P,\gamma}(e)) = \{\widetilde{F}_{P,\gamma}{}^{3}(e)) - V(\widetilde{F}_{P,\gamma}{}^{3^C}(e))\}$

$$V(\widetilde{F}_{P,\gamma}(e_1)) = \{x_1/0, x_2/0.3, x_3/0.6, x_4/\text{-}1.3\}$$
$$V(\widetilde{F}_{P,\gamma}(e_2)) = \{x_1/\text{-}1.4, x_2/0.2, x_3/1.0, x_4/\text{-}1.0\}$$
$$V(\widetilde{F}_{P,\gamma}(e_3)) = \{x_1/0.8, x_2/\text{-}0.6, x_3/\text{-}0.8, x_4/0.8\}$$
$$V(\widetilde{F}_{P,\gamma}(e_4)) = \{x_1/\text{-}1.2, x_2/1.0, x_3/0.2, x_4/\text{-}0.4\}$$
$$V(\widetilde{K}_{V,\tau}(e_1)) = \{x_1 x_2/\text{-}0.6, x_2 x_3/0.1, x_3 x_4/\text{-}1.2, x_2 x_4/\text{-}1.4\}$$
$$V(\widetilde{K}_{V,\tau}(e_2)) = \{x_1 x_2/\text{-}1.2, x_2 x_3/0, x_3 x_4/\text{-}1.0, x_2 x_4/\text{-}2\}$$
$$V(\widetilde{K}_{V,\tau}(e_3)) = \{x_1 x_2/0, x_2 x_3/\text{-}1, x_3 x_4/0.1, x_2 x_4/\text{-}0.9\}$$
$$V(\widetilde{K}_{V,\tau}(e_4)) = \{x_1 x_2/\text{-}1.2, x_2 x_3/0.2, x_3 x_4/\text{-}1.2, x_2 x_4/\text{-}1.2\}$$

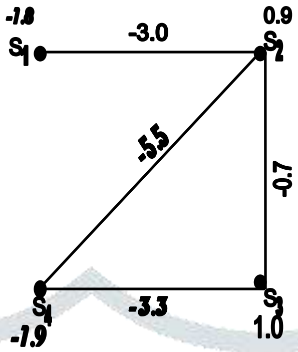


(Figure 9)

$$V(\tilde{F}_{P,\gamma}(e)) = \{ \tilde{F}_{P,\gamma}{}^{3}(e)) - V(\tilde{F}_{P,\gamma}{}^{3^C}(e))\}$$

Compute the total score S_i

$$\widetilde{F}_{P,\gamma}(e) = \{s_1/-1.8, s_2/0.9, s_3/1.0, s_4/-1.19\}$$
$$\widetilde{K}_{V,\tau}(e) = \{s_1s_2/-3.0, s_2s_3/-0.7, s_3s_4/-3.3, s_3s_4/-5.5\}$$



(Figure 10)

we see that S_3 orphanage act as a real refuge to the orphans with regard to the nature of service and has the maximum value and thus come to a conclusion that orphanage S_3has secured the highest total.Hence orphanage is selected as role model organization which render valuable multifarious activities and best service given among the orphanages.

VI. Conclusion

In this paper, we have applied the motto of fuzzy soft graphs and complement of fuzzy soft graph in decision making problem. Finally we attribute our contribution would enhance this study on fuzzy soft graphs which will give a note worthy result in this field.

References

[1] Ahmad, B. and Kharal, A. On fuzzy soft sets, Hindawi publishing corporation, Advances in fuzzy systems, Article ID 586507, (2009), 6 pages,doi:10.1155/2009/86507.
[2] Aktas, H. and Cagman, N.Soft sets and soft groups, Information Sciences, 177(2007) 2726-2735.
[3] Alkhazaleh,S. and Salleh,A,R. and Hassan,N. Possibilityof fuzzy soft set, Advances in Decision Sciences,2011,Article ID 47956, doi: 10, 1155/2011/479756, 18 pages.
[4] Atanassov, K.Intutionistic fuzzy sets, Fuzzy sets and systems, 20(1986)87-96.
[5] Atanassov, K..Intutionistic fuzzy sets: theory and applications, springer-verlag, Heideberg, 1999.
[6] Borah, M. and Neog, T, J. and Sut.D.K,A. study on some operations of fuzzy soft sets, International journal of modern Engineering research, 2(2)(2012) 157-168.tic f
[7] Karunambigai, K, G. and Parvathi, R.Intuitionistic fuzzy graphs Journal of computational intelligence: theory and Applications, 20(2006)139-150.
[8] Kauffman, Introduction a la theories des sous ensembles flous, Massonet cie., vol.1,(1973).
[9] Maji.P.K, Biswas.R and Roy, A, R. Fuzzy soft sets, J. Fuzzy math., 9(3) (2001)589-602.
[10] Maji.P.K,Biswas.R and Roy, A,R.Intuitionistic Fuzzy soft sets, J. Fuzzy math.,9(3)(2001)677-692.
[11] Maji, P,K. and Biswas,R. and Roy,A,R. Soft set theory, J. compt. math. Appl., 45(2003)555-562
[12] Majumdar, P and Samanta, S, K.Generalized fuzzy soft sets, computers and mathematics with applications, 59(2010)1425-1432.
[13] Molodtsov, D, A.Soft set theory- first results, compt.math.appl.,37(1999)19-31.
[14] Molodtsov, D, A.The description of a dependence with the help of soft sets, J.Compt.Sys.SC.Int.,40(6)(2001)977-984.
[15] Molodtsov, D, A.Theory of soft sets, URRS publishers, Moscow, 2004.
[16] Molodtsov,D ,A. and.Yu.Leonov and Kovkov,D,K,Soft set technique and its application,1(1)(2006)8-39.
[17] Neog, T, J. and Sut, D, K.On fuzzy soft compliment and related properties, international journal of energy, information and communication.
[18] Thumbakara, R, K. and George, B.Soft graph, Gen.Math. Notes,21(2)(2014)75-86.
[19] Rosenfeld, A. Fuzzy graphs and Zadeh, L, A. Fuzzy sets and their applications to cognitive and decision Process, Acadamic Priontess, New York, 1975, 75-95.

[20] Mohinda, S. and Samanta, T, K. An introduction to fuzzy soft graph,mathematica moravica,19-2(2015)35-48.
[21] Yang, H, L.Notes on generalized fuzzy soft sets, Journal of mathematical research exposition, 31(3) (2011)567-570.
[22] Zadeh, L, A.Fuzzy sets, Information and Control, 8(1965)338-353.