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ASSIGNMENT PROBLEM IN ENNEADECAGONAL FUZZY NUMBER

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ABSTRACT

An Assignment problem is very imperative type of linear programming problem which is used for allocating resources in an optimal way. Assignment problem has various applications in real world and day to day life situations. Strategy of fuzzy assignment problem is more appropriate than the conventional assignment problem. An enneadecagonal fuzzy assignment problem is altered into crisp valued problem using ranking method. We have applied regular method to obtain a minimum assignment cost in fuzzy environment for a fuzzy assignment problem with all parameters are enneadecagonal fuzzy numbers.

Keywords: Fuzzy number, Enneadecagonal fuzzy number, Fuzzy assignment problem, ranking method.

1. INTRODUCTION

Fuzzy sets are instigated and developed by Zadeh[1]. It was distended most and used vast in almost all the fields of engineering and Computational Mathematics. Fuzzy is to deal with uncertainty, indistinctness in our situation. Since the introduction of fuzzy set, remarkable advances have been made for the improvement of many methodologies by many researchers. Fuzzy applications are mainly useful in various decision making problems. Raju and Jayagopal [2]again has introduced the Icosikaitetragonal fuzzy number.

R.Dhananchezhiyan and V.Raju [3] have introduced enneadecagonal fuzzy number and its membership function .Here we are making use of an Enneadecagonal fuzzy number to solve the assignment problem. Assignment problems are largely used in manufacturing and service system. Project management is designed to control organization resources on a given set of activities, within time, cost and quality.

Therefore, the limited resources must be used efficiently such that the optimal available resources can be assigned to the most needed tasks so as to maximize and minimize the profit and cost respectively. In this paper, fuzzy assignment problem is transformed into crisp valued problem using ranking technique for Enneadecagonal fuzzy number. We have used regular method to find the optimal solution and the examples are given and explained.

2. PRELIMINARIES

In this section, we give the preliminaries that are required for this study.

Definition 2.1. A fuzzy set A is defined by $A = \{(x, \mu_A(x)) : x \in A, \mu_A(x) \in [0,1]\}$. Here x is crisp set A and $\mu_A(x)$ is membership function in the interval [0,1].

Definition 2.2. The fuzzy number A is a fuzzy set whose membership function must satisfy the following conditions.

(i) A fuzzy set A of the universe of discourse X is convex

(ii) A fuzzy set A of the universe of discourse X is a normal fuzzy set if $x_i \in X$ exists

(iii) $\mu_A(x)$ is piecewise continuous

Definition 2.3 An α-cut of fuzzy set A is classical set defined as $^{\alpha}[A] = \{x \in X | \mu_A(x) \geq \alpha\}$

Definition 2.4 A fuzzy set A is a convex fuzzy set iff each of its α-cut $^{\alpha}A$ is a convex set.

Definition 2.5 Mathematical model of an assignment problem:

The general form of Fuzzy assignment problem is

Minimize $z = \sum_{i=1}^{n}\sum_{j=1}^{n} C_{ij} X_{ij}$

Subject to the constraints $\sum_{j=1}^{n} x_{ij} = 1 \quad for\ i = 1,2,.....n$

$$\sum_{i=1}^{n} x_{ij} = 1,\ j = 1,2,3.....n$$

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$$where \quad x_{ij} = \begin{cases} 1, \text{if the i}^{th} \text{ person is assigned the j}^{th} \text{ job} \\ 0, otherwise \end{cases}$$

2.6 Ranking of Enneadecagonal fuzzy number:

Let I be a normal Enneadecagonal fuzzy number. The value M (I), called as measure of I is calculated as

$$M(I) = \frac{e_1 + e_2 + e_3 + e_4 + e_5 + e_6 + e_7 + e_8 + e_9 + e_{10} + e_{11} + e_{12} + e_{13} + e_{14} + e_{15} + e_{16} + e_{17} + e_{18} + e_{19}}{19}$$

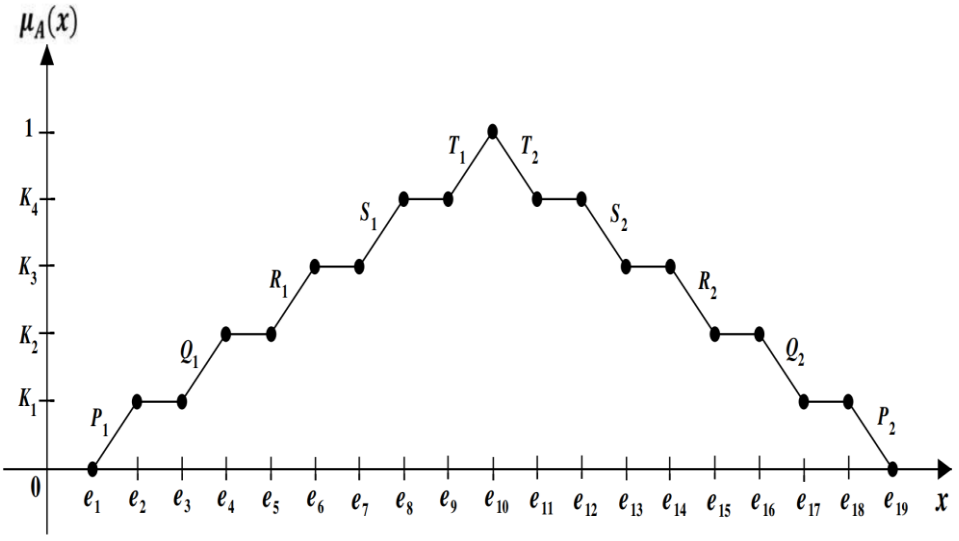
$$where \ 0 \le k_1 \le k_2 \le k_3 \le k_4 \le 1$$

Definition 2.7

A fuzzy number A = $(a_1, a_2, a_3, a_4, a_5, a_6, a_7, a_8, a_9, a_{10}, \ldots\ldots a_{19})$ is Enneadecagonal fuzzy number and its membership function is given by

$$\mu_E(x) = \begin{cases} 0, for \ x < e_1 \\ k_1\left(\frac{x - e_1}{e_2 - e_1}\right), for \ e_1 \le x \le e_2 \\ k_1, for \ e_2 \le x \le e_3 \\ k_1 + (k_2 - k_1)\left(\frac{x - e_3}{e_4 - e_3}\right), for \ e_3 \le x \le e_4 \\ k_2, for \ e_4 \le x \le e_5 \\ k_2 + (k_3 - k_2)\left(\frac{x - e_5}{e_6 - e_5}\right), for \ e_5 \le x \le e_6 \\ k_3, e_6 \le x \le e_7 \\ k_3 + (k_4 - k_3)\left(\frac{x - e_7}{e_8 - e_7}\right), for \ e_7 \le x \le e_8 \\ k_4, for \ e_8 \le x \le e_9 \\ k_4 + (1 - k_4)\left(\frac{x - e_9}{e_{10} - e_9}\right), for \ e_9 \le x \le e_{10} \\ k_4 + (1 - k_4)\left(\frac{e_{10} - x}{e_{11} - e_{10}}\right), for \ e_{10} \le x \le e_{11} \\ k_4, for \ e_{11} \le x \le e_{12} \\ k_3 + (k_4 - k_3)\left(\frac{e_{12} - x}{e_{13} - e_{12}}\right), for \ e_{12} \le x \le e_{13} \\ k_3, for \ e_{13} \le x \le e_{14} \\ k_2 + (k_3 - k_2)\left(\frac{e_{14} - x}{e_{15} - e_{14}}\right), for \ e_{14} \le x \le e_{15} \\ k_2, for \quad e_{15} \le x \le e_{16} \\ k_1 + (k_2 - k_1)\left(\frac{e_{16} - x}{e_{17} - e_{16}}\right), for \ e_{16} \le x \le e_{17} \\ k_1, for \ e_{17} \le x \le e_{18} \\ k_1\left(\frac{e_{18} - x}{e_{19} - e_{18}}\right), for \ e_{18} \le x \le e_{19} \\ 0, for \ x > e_{19} \end{cases}$$

2.8 Diagram of Enneadecagonal fuzzy number:



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3.0 Numerical Example :

Consider the following 3×3 fuzzy Assignment problem

$$\begin{bmatrix} (-4,-3,-2,-1,0,1,2,3,4,5,6,7,8,9,10,11,12,13,14) & (-3,-2,-1,0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15) & (1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19) \\ (-3,-2,-1,0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15) & (-2,-1,0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16) & (0,1,2,4,5,6,7,8,9,10,11,12,13,14,16,18,20,22,24) \\ (0,1,2,3,4,5,6,7,9,10,11,13,14,15,17,19,21,22,25) & (1,2,3,6,8,9,10,12,13,15,16,17,19,20,22,23,25,28,30) & (-3,-2,-1,0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15) \end{bmatrix}$$

Step 1: This problem is solved by taking the values $for \quad k_1=\frac{1}{5}, k_2=\frac{2}{5}, k_3=\frac{3}{5}, k_4=\frac{4}{5}$

We obtain the values of Measure of matrix A and is denoted by $\mu_{EDC}(a_{ij})$

a_{11}	-4,-3,-2,-1,0,1,2,3,4,5,6,7,8,9,10,11,12,13,14	$\mu_{EDC}(a_{11}) = 5$
a_{12}	-3,-2,-1,0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	$\mu_{EDC}(a_{12}) = 6$
a_{13}	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19	$\mu_{EDC}(a_{13}) = 10$
a_{21}	-3,-2,-1,0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	$\mu_{EDC}(a_{21}) = 6$
a_{22}	-2,-1,0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	$\mu_{EDC}(a_{22}) = 7$
a_{23}	0,1,2,4,5,6,7,8,9,10,11,12,13,14,16,18,20,22,24	$\mu_{EDC}(a_{23}) = 10.63$
a_{31}	0,1,2,3,4,5,6,7,9,10,11,13,14,15,17,19,21,22,25	$\mu_{EDC}(a_{31}) = 10.68$
a_{32}	1,2,3,6,8,9,10,12,13,15,16,17,19,20,22,23,25,28,30	$\mu_{EDC}(a_{32}) = 14.16$
a_{33}	-3,-2,-1,0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	$\mu_{EDC}(a_{33}) = 6$

After ranking method, we have

$$\begin{bmatrix} 5 & 6 & 10 \\ 6 & 7 & 10..63 \\ 10.68 & 14.16 & 6 \end{bmatrix}$$

By solving the assignment technique, we have

$$\begin{bmatrix} 0 & 0 & 5 \\ 0 & 0 & 4.63 \\ 4.68 & 7.16 & 0 \end{bmatrix}$$

The Assignment cost = 5+ 7 + 6 = 18

3. CONCLUSION

In this paper, an Enneadecagonal fuzzy number has been used for decision the exposition of fuzzy assignment problem using ranking method and transforming fuzzy assignment problem into crisp valued problem. We applied standard method to discover the optimal solution for the fuzzy assignment problem and illustrated by a numerical example.

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