International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2015): 78.96 | Impact Factor (2015): 6.391

(G. n)–Tupled Coincidence Point Theorems in the Fuzzy Metric Spaces

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Abstract: ***The purpose of this work is to introduce a new concepts of $(G.n)$ – tupled fixed point and $(G.n)$ – tupled coincidencepoint, also we prove the existence and uniqueness of$(G.n)$ – tupled coincidence point in fuzzy metric space .the main results obtaind in this paper extend and improve of many results well_ known in the fuzzy metric spaces.***

Keywords: fuzzy metric spaces, continuous t – norm, fixed point , upper semi – continuous, equicontinuous.

1. Introduction

One of the main theorems in the fixed point theory is Banach contraction theorem [1].Many authors studied the generalization of this theorem on the complete partial ordered metric space wasgiven by ran and reurings[2].Bhaskar and lakshmikantham [3]introduced the concept of coupled fixed point .Later on , lakshmikantham and Ciric [4]introduced concept of coincidence point which is generalization of fixed point .The coupled fixed point theorems are studied for type of contraction mapping see [5,6].On other hand ,the theory of fuzzy set was introduced by zadeh[7].Kramosil and michalek[8] introduced the fuzzy metric space by generalized the concept of probabilistic metric space to fuzzy situation .

In this paper, we introduced a concepts of $(G.n)$– tupled coincidence point, $(G.n)$ – tupled coincidence point and$(G.n)$ –commute. Also, we establish the existence and uniqueness of $(G.n)$ – tupled coincidence point theorems in fuzzy metric space with complete partial ordered .

Now, we recall some of the definitions used in this paper

Definition 1. [3]
A binary operation $*:[0,1]^2 \to [0,1]$ is called a continuous t– norm if the following conditions are satisfy:

- $*$ is a associative and commutative.
- $a * 1 = a \quad \forall a \in [0,1]$.
- $a * b \le c * d$ whenever $a \le c \,\&\, b \le d,\ \forall\, a,b,c,d \in [0,1]$.
- $*$ is continuous.

Definition 2.[4]
A triple $(X, M,*)$ is called fuzzy matric space if $X \ne \emptyset$, $*$ is continuous t – norm and $M: X \times X \times (0,\infty) \to [0,1]$ is a fuzzy set the satisfying the following conditions:

- $M_{(x,y,t)} > 0$
- $M_{(x,y,t)} = 1 \ iff \ x = y$
- $M_{(x,y,t)} = M_{(y,x,t)}$
- $M_{(x,y,.)}: (0,\infty) \to [0,1]$ is continuous.
- $M_{(x,z,t+s)} \ge M_{(x,y,t)} * M_{(y,z,s)} \ \ \forall\, t,s > 0$

We will add the condition $\lim_{t\to\infty} M_{(x,y,t)} = 1 \quad \forall x,y \in X$

Lemma 3. [3]
In any fuzzy metric space $(X, M,*)$, where $*$ is a continuous t – norm of H – type. If there exit $\emptyset \in \phi$ such that $M_{(x,y,\emptyset(t))} \le M_{(x,y,t)}$, $\forall\, t > 0$ then $x = y$.

Definition 4. [9]
For any $a \in [0,1]$, the sequence $<*^n a>^{\infty}_{n=1}$ be defined by:
$*^1 a = a \ and \ *^n a = (*^{n-1} a) * a$. Then a t – norm $*$ is said to be of H – type if the sequence $<*^n a>^{\infty}_{n=1}$ is equicontinuousat $a = 1$.

Definition 5. [10]
Let$(X, M,*)$be a fuzzy metric space $(X, M,*)$.

(i) A sequence in(x_n) in X is said to be convergent to a point $x \in X$ if $\lim_{t\to\infty} M_{(x_n,x,t)} = 1$for all $t > 0$.

(ii) A sequence in(x_n) in X is called a Cauchy sequence if for each $0 < \varepsilon < 1 \ and \ t > 0$,there exists a positive integer n_0 such that $M_{(x_n,x_m,t)} > 1 - \varepsilon$ for each $n, m \ge n_0$

Defintion 6.
Let $f_1, f_2, \dots\dots, f_n: X^n \to X$ are mappings. Any element $(x_1, x_2, \dots\dots, x_n) \in X^n$ is called a $(G.n)$_tupled fixed point of this mappings if

$$f_1\Big(f_2\big(\dots\dots\big(f_{n(x_1,x_2,\dots,x_n)}\big)\dots..\big)\Big) = x_1$$
$$f_1\Big(f_2\big(\dots\dots\big(f_{n(x_2,x_3,\dots,x_1)}\big)\dots..\big)\Big) = x_2$$
$$\vdots$$
$$\vdots$$
$$f_1\Big(f_2\big(\dots\dots\big(f_{n(x_n,x_1,\dots,x_{n-1})}\big)\dots..\big)\Big) = x_n$$

Definition7.
Let $f_1, f_2, \dots\dots, f_n: X^n \to X \ and \ g_1, g_2, \dots\dots, g_n: X \to X$ are mappings. Any element $(x_1, x_2, \dots\dots, x_n) \in X^n$ is called $(G.n)$ – tupledcoincidence point of this mapping if

$$f_1\Big(f_2\big(\dots\dots\big(f_{n(x_1,x_2,\dots,x_n)}\big)\dots..\big)\Big) = g_1\Big(g_2\big(\dots\dots\big(g_{n(x_1)}\big)\dots..\big)\Big)$$
$$f_1\Big(f_2\big(\dots\dots\big(f_{n(x_2,x_3,\dots,x_1)}\big)\dots..\big)\Big) = g_1\Big(g_2\big(\dots\dots\big(g_{n(x_2)}\big)\dots..\big)\Big)$$
$$\vdots$$
$$\vdots$$

$$f_1\left(f_2(\dots\dots(f_{n(x_n,x_1,\dots,x_{n-1})})\dots..)\right) = g_1\left(g_2(\dots\dots(g_{n(x_n)})\dots..)\right)$$

In this paper ,we consider $\emptyset$ is the set of all mappings $\emptyset:[0,\infty) \to [0,\infty)$ such that:

- $\emptyset$ is non – decreasing.
- $\emptyset$ is upper semi – continuous from the right.
- $\sum_{n=0}^{\infty} \emptyset^n{}_{(t)} < \infty$; $\forall t > 0$ $where\ \emptyset^{n+1}{}_{(t)} = \emptyset(\emptyset^n{}_{(t)})$, $n \in N$.

2. Main Results

Theorem (1):

Let $A\ and\ B$ are two families of mappings such that $= \{f_1, f_2, \dots\dots, f_n: X^n \to X\}$, $B = \{g_1, g_2, \dots\dots, g_n: X \to X\}$ and let $(X, M,*)$ be a fuzzy metric space such that $*$ is a t – norm of H – type. Suppose that $\emptyset \in \phi$ satisfying

$$M[f_1\left(f_2(\dots\dots(f_{n(x_1,x_2,\dots,x_n)})\dots..)\right), f_1\left(f_2(\dots\dots(f_{n(y_1,y_2,\dots,y_n)})\dots..)\right)\emptyset_{(t)}] \geq$$
$$M\left[g_1\left(g_2(\dots\dots(g_{n(x_1)})\dots..)\right), g_1\left(g_2(\dots\dots(g_{n(y_1)})\dots..)\right), t\right] *$$
$$M\left[g_1\left(g_2(\dots\dots(g_{n(x_2)})\dots..)\right), g_1\left(g_2(\dots\dots(g_{n(y_2)})\dots..)\right), t\right] * \dots\dots *$$
$$M\left[g_1\left(g_2(\dots\dots(g_{n(x_n)})\dots..)\right), g_1\left(g_2(\dots\dots(g_{n(y_n)})\dots..)\right), t\right] (1)$$

Where $t > 0$ and $x_i, y_i \in X$ $\forall\ i = 1,2, \dots\dots, n$

If $g_1\left(g_2(\dots\dots(g_{n(X)})\dots..)\right)$ is complete subspace of X containing $f_1\left(f_2(\dots\dots(f_{n(X^n)})\dots..)\right)$.then there exists Then a unique $(G.n)$ –tupled coincidence fixed point of compose the mappings of $A$and B.

Proof:

Consider$x_0{}^1, x_0{}^2, \dots\dots, x_1{}^n \in X$, since $g_1\left(g_2(\dots\dots(g_{n(X)})\dots..)\right)$ containing $f_1\left(f_2(\dots\dots(f_{n(X^n)})\dots..)\right)$, that there exists $x_1{}^1, x_1{}^2, \dots\dots, x_1{}^n \in X$ such that

$$g_1\left(g_2\left(\dots\dots(g_{n(x_1{}^1)})\dots..\right)\right) = f_1\left(f_2\left(\dots\dots(f_{n(x_0{}^1,x_0{}^2,\dots,x_0{}^n)})\dots..\right)\right)$$
$$g_1\left(g_2\left(\dots\dots(g_{n(x_1{}^2)})\dots..\right)\right) = f_1\left(f_2\left(\dots\dots(f_{n(x_0{}^2,x_0{}^3,\dots,x_0{}^n,x_0{}^1)})\dots..\right)\right)$$
$$\vdots$$
$$g_1\left(g_2(\dots\dots(g_{n(x_1{}^n)})\dots..)\right) = f_1\left(f_2\left(\dots\dots(f_{n(x_0{}^n,x_0{}^1,\dots,x_0{}^{n-1})})\dots..\right)\right)$$

Also,

$$g_1\left(g_2\left(\dots\dots(g_{n(x_2{}^1)})\dots..\right)\right) = f_1\left(f_2\left(\dots\dots(f_{n(x_1{}^1,x_1{}^2,\dots,x_1{}^n)})\dots..\right)\right)$$
$$g_1\left(g_2\left(\dots\dots(g_{n(x_2{}^2)})\dots..\right)\right) = f_1\left(f_2\left(\dots\dots(f_{n(x_1{}^2,x_1{}^3,\dots,x_1{}^n,x_1{}^1)})\dots..\right)\right)$$
$$\vdots$$
$$g_1\left(g_2(\dots\dots(g_{n(x_2{}^n)})\dots..)\right) = f_1\left(f_2\left(\dots\dots(f_{n(x_1{}^n,x_1{}^1,\dots,x_1{}^{n-1})})\dots..\right)\right)$$

In general, we can construct the sequences, $< g_1\left(g_2\left(\dots\dots(g_{n(x_k{}^1)})\dots..\right)\right) >$, $< g_1\left(g_2\left(\dots\dots(g_{n(x_k{}^2)})\dots..\right)\right) >, \dots, and\ < g_1\left(g_2(\dots\dots(g_{n(x_k{}^n)})\dots..)\right) >$ as

$$g_1\left(g_2\left(\dots(g_{n(x_k{}^1)})\dots\right)\right) = f_1\left(f_2\left(\dots(f_{n(x_{k-1}{}^1,x_{k-1}{}^2,\dots,x_{k-1}{}^n)})..\right)\right)$$
$$g_1\left(g_2\left(\dots(g_{n(x_k{}^2)})\dots\right)\right) = f_1\left(f_2\left(\dots(f_{n(x_{k-1}{}^2,x_{k-1}{}^3,\dots,x_1{}^n,x_{k-1}{}^1)})\dots\right)\right)$$
$$\vdots$$
$$g_1\left(g_2(\dots(g_{n(x_k{}^n)})\dots)\right) = f_1\left(f_2\left(\dots(f_{n(x_{k-1}{}^n,x_{k-1}{}^1,\dots,x_{k-1}{}^{n-1})})\dots\right)\right)$$

We want to show that the above sequences are Cauchy sequences in $(X, M,*)$, since $*$ is t – norm of H – type, this implies

$\forall\ \lambda > 0\ \exists\ \mu > 0$ such that :

$(1-\mu) * (1-\mu) * \dots * (1-\mu) \geq 1 - \lambda$, $\forall n \in N$. on other hand. For all $x, y \in X$, $M(x, y,.)$ is continuous and $\lim_{t\to\infty}(x, y, t) = 1$ then there exists $t_\circ > 0$ such that.

$$M\left[g_1\left(g_2\left(\dots\dots(g_{n(x_0{}^1)})\dots\right)\right), g_1\left(g_2\left(\dots\dots(g_{n(x_1{}^1)})\dots\right)\right), t_0\right] \geq 1-\mu$$
$$M\left[g_1\left(g_2\left(\dots\dots(g_{n(x_0{}^2)})\dots\right)\right), g_1\left(g_2\left(\dots\dots(g_{n(x_1{}^2)})\dots\right)\right), t_0\right] \geq 1-\mu$$

⋮(2)

$$\vdots$$
$$M\left[g_1\left(g_2(\dots\dots(g_{n(x_o{}^n)})\dots)\right), g_1\left(g_2(\dots\dots(g_{n(x_1{}^n)})\dots)\right), t_0\right] \geq 1-\mu$$

By using (1), we get

$$M\left[g_1\left(g_2\left(\dots\dots(g_{n(x_1{}^1)})\dots\right)\right), g_1\left(g_2\left(\dots\dots(g_{n(x_2{}^1)})\dots\right)\right), \emptyset_{(t_0)}\right] =$$

$$M\left[f_1\left(f_2\left(\ldots\left(f_{n(x_0{}^1,x_0{}^2,\ldots,x_0{}^n)}\right)\ldots\right)\right), f_1\left(f_2\left(\ldots\left(f_{n(x_1{}^1,x_1{}^2,\ldots,x_1{}^n)}\right)\ldots\right)\right), \emptyset_{(t_0)}\right]$$
$$\geq M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_0{}^1)}\right)\ldots\right)\right), g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_1{}^1)}\right)\ldots\right)\right), t_0\right] *$$
$$M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_0{}^2)}\right)\ldots\right)\right), g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_1{}^2)}\right)\ldots\right)\right), t_0\right] * \ldots\ldots *$$
$$M\left[g_1\left(g_2(\ldots\ldots(g_{n(x_0{}^n)})\ldots)\right), g_1\left(g_2(\ldots\ldots(g_{n(x_1{}^n)})\ldots)\right), t_0\right]$$

Also,

$$M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_1{}^2)}\right)\ldots\right)\right), g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_2{}^2)}\right)\ldots\right)\right), \emptyset_{(t_0)}\right] =$$
$$M\left[f_1\left(f_2\left(\ldots\left(f_{n(x_0{}^2,x_0{}^3,\ldots,x_0{}^n,x_0{}^1)}\right)\ldots\right)\right), f_1\left(f_2\left(\ldots\left(f_{n(x_1{}^2,x_1{}^3,\ldots,x_1{}^n,x_0{}^1)}\right)\ldots\right)\right), \emptyset_{(t_0)}\right]$$
$$\geq M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_0{}^2)}\right)\ldots\right)\right), g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_1{}^2)}\right)\ldots\right)\right), t_0\right] *$$
$$M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_0{}^3)}\right)\ldots\right)\right), g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_1{}^3)}\right)\ldots\right)\right), t_0\right] * \ldots\ldots *$$
$$M\left[g_1\left(g_2(\ldots\ldots(g_{n(x_0{}^n)})\ldots)\right), g_1\left(g_2(\ldots\ldots(g_{n(x_1{}^n)})\ldots)\right), t_0\right]$$

We continue this process in the same way

$$M\left[g_1\left(g_2(\ldots\ldots(g_{n(x_1{}^n)})\ldots)\right), g_1\left(g_2(\ldots\ldots(g_{n(x_2{}^n)})\ldots)\right), \emptyset_{(t_0)}\right] =$$
$$M\left[f_1\left(f_2\left(\ldots\left(f_{n(x_0{}^n,x_0{}^1,\ldots,x_0{}^{n-1})}\right)\ldots\right)\right), f_1\left(f_2\left(\ldots\left(f_{n(x_1{}^n,x_1{}^1,\ldots,x_1{}^{n-1})}\right)\ldots\right)\right), t_0\right]$$
$$\geq M\left[g_1\left(g_2(\ldots\ldots(g_{n(x_0{}^n)})\ldots)\right), g_1\left(g_2(\ldots\ldots(g_{n(x_1{}^n)})\ldots)\right), t_0\right] *$$
$$M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_0{}^1)}\right)\ldots\right)\right), g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_1{}^1)}\right)\ldots\right)\right), t_0\right] * \ldots\ldots *$$
$$M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_0{}^{n-1})}\right)\ldots\right)\right), g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_1{}^{n-1})}\right)\ldots\right)\right), t_0\right]$$

As the same way and by using above inequalities,

$$M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_2{}^1)}\right)\ldots\right)\right), g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_3{}^1)}\right)\ldots\right)\right), \emptyset^2{}_{(t_0)}\right] =$$
$$M\left[f_1\left(f_2\left(\ldots\left(f_{n(x_1{}^1,x_1{}^2,\ldots,x_1{}^n)}\right)\ldots\right)\right), f_1\left(f_2\left(\ldots\left(f_{n(x_2{}^1,x_2{}^2,\ldots,x_2{}^n)}\right)\ldots\right)\right), \emptyset^2{}_{(t_0)}\right]$$
$$\geq M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_1{}^1)}\right)\ldots\right)\right), g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_2{}^1)}\right)\ldots\right)\right), \emptyset_{(t_0)}\right] *$$
$$M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_1{}^2)}\right)\ldots\right)\right), g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_2{}^2)}\right)\ldots\right)\right), \emptyset_{(t_0)}\right] * \ldots *$$
$$M\left[g_1\left(g_2(\ldots\ldots(g_{n(x_1{}^n)})\ldots)\right), g_1\left(g_2(\ldots\ldots(g_{n(x_2{}^n)})\ldots)\right), \emptyset_{(t_0)}\right]$$
$$\geq M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_0{}^1)}\right)\ldots\right)\right), g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_1{}^1)}\right)\ldots\right)\right), t_0\right]^n *$$
$$M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_0{}^2)}\right)\ldots\right)\right), g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_1{}^2)}\right)\ldots\right)\right), t_0\right]^n * \ldots\ldots *$$
$$M\left[g_1\left(g_2(\ldots\ldots(g_{n(x_0{}^n)})\ldots)\right), g_1\left(g_2(\ldots\ldots(g_{n(x_1{}^n)})\ldots)\right), t_0\right]^n$$

- $$M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_2{}^2)}\right)\ldots\right)\right), g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_3{}^2)}\right)\ldots\right)\right), \emptyset^2{}_{(t_0)}\right] =$$

$$M\left[f_1\left(f_2\left(\ldots\left(f_{n(x_1{}^2,x_1{}^3,\ldots,x_1{}^n,x_1{}^1)}\right)\ldots\right)\right), f_1\left(f_2\left(\ldots\left(f_{n(x_2{}^2,x_2{}^3,\ldots,x_2{}^n,x_1{}^1)}\right)\ldots\right)\right), \emptyset^2{}_{(t_0)}\right]$$
$$\geq M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_1{}^2)}\right)\ldots\right)\right), g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_2{}^2)}\right)\ldots\right)\right), \emptyset_{(t_0)}\right] *$$
$$M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_1{}^3)}\right)\ldots\right)\right), g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_2{}^3)}\right)\ldots\right)\right), \emptyset_{(t_0)}\right] * \ldots *$$
$$M\left[g_1\left(g_2(\ldots\ldots(g_{n(x_1{}^n)})\ldots)\right), g_1\left(g_2(\ldots\ldots(g_{n(x_2{}^n)})\ldots)\right), \emptyset_{(t_0)}\right]$$
$$\geq M\left[g_1\left(g_2(\ldots\ldots(g_{n(x_0{}^n)})\ldots)\right), g_1\left(g_2(\ldots\ldots(g_{n(x_1{}^n)})\ldots)\right), t_0\right]^n *$$
$$M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_0{}^1)}\right)\ldots\right)\right), g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_1{}^1)}\right)\ldots\right)\right), t_0\right]^n * \ldots\ldots *$$
$$M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_0{}^{n-1})}\right)\ldots\right)\right), g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_1{}^{n-1})}\right)\ldots\right)\right), t_0\right]^n$$

Continue this process, we get

$$M\left[g_1\left(g_2(\ldots\ldots(g_{n(x_2{}^n)})\ldots)\right), g_1\left(g_2(\ldots\ldots(g_{n(x_3{}^n)})\ldots)\right), \emptyset^2{}_{(t_0)}\right] =$$
$$M\left[f_1\left(f_2\left(\ldots\left(f_{n(x_2{}^n,x_2{}^1,\ldots,x_2{}^{n-1})}\right)\ldots\right)\right), f_1\left(f_2\left(\ldots\left(f_{n(x_3{}^n,x_3{}^1,\ldots,x_3{}^n)}\right)\ldots\right)\right), \emptyset^2{}_{(t_0)}\right]$$

$$\geq M\left[g_1\left(g_2(\dots\dots(g_{n(x_2{}^n)})\dots)\right), g_1\left(g_2(\dots\dots(g_{n(x_3{}^n)})\dots)\right), \emptyset_{(t_0)}\right] *$$
$$M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_2{}^1)}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_3{}^1)}\right)\dots\right)\right), \emptyset_{(t_0)}\right] * \dots *$$
$$M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_2{}^{n-1})}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_3{}^{n-1})}\right)\dots\right)\right), \emptyset_{(t_0)}\right]$$
$$\geq M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_0{}^1)}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_1{}^1)}\right)\dots\right)\right), t_0\right]^n *$$
$$M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_0{}^2)}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_1{}^2)}\right)\dots\right)\right), t_0\right]^n * \dots\dots *$$
$$M\left[g_1\left(g_2(\dots\dots(g_{n(x_0{}^n)})\dots)\right), g_1\left(g_2(\dots\dots(g_{n(x_1{}^n)})\dots)\right), t_0\right]^n$$

Similarly

- $$M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_k{}^1)}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_{k+1}{}^1)}\right)\dots\right)\right), \emptyset^k{}_{(t_0)}\right] =$$

$$M\left[f_1\left(f_2\left(\dots\left(f_{n(x_{k-1}{}^1, x_{k-1}{}^2, \dots, x_{k-1}{}^n)}\right)\dots\right)\right), f_1\left(f_2\left(\dots\left(f_{n(x_k{}^1, x_k{}^2, \dots, x_k{}^n)}\right)\dots\right)\right), \emptyset^k{}_{(t_0)}\right]$$
$$\geq M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_{k-1}{}^1)}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_k{}^1)}\right)\dots\right)\right), \emptyset^{k-1}{}_{(t_0)}\right] *$$
$$M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_{k-1}{}^2)}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_k{}^2)}\right)\dots\right)\right), \emptyset^{k-1}{}_{(t_0)}\right] * \dots *$$
$$M\left[g_1\left(g_2(\dots\dots(g_{n(x_{k-1}{}^n)})\dots)\right), g_1\left(g_2(\dots\dots(g_{n(x_k{}^n)})\dots)\right), \emptyset^{k-1}{}_{(t_0)}\right]$$
$$\vdots$$
$$\geq M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_0{}^1)}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_1{}^1)}\right)\dots\right)\right), t_0\right]^{n^{k-1}} *$$
$$M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_0{}^2)}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_1{}^2)}\right)\dots\right)\right), t_0\right]^{n^{k-1}} * \dots\dots *$$
$$M\left[g_1\left(g_2(\dots\dots(g_{n(x_0{}^n)})\dots)\right), g_1\left(g_2(\dots\dots(g_{n(x_1{}^n)})\dots)\right), t_0\right]^{n^{k-1}}$$

Also,

$$M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_k{}^2)}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_{k+1}{}^2)}\right)\dots\right)\right), \emptyset^k{}_{(t_0)}\right] =$$
$$M\{f_1\left(f_2\left(\dots\left(f_{n(x_{k-1}{}^2, x_{k-1}{}^3, \dots, x_{k-1}{}^n, x_{k-1}{}^1)}\right)\dots\right)\right),$$
$$f_1\left(f_2\left(\dots\left(f_{n(x_k{}^2, x_k{}^3, \dots, x_k{}^n, x_k{}^1)}\right)\dots\right)\right), \emptyset^k{}_{(t_0)}]$$
$$\geq M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_{k-1}{}^2)}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_k{}^2)}\right)\dots\right)\right), \emptyset^{k-1}{}_{(t_0)}\right] *$$
$$M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_{k-1}{}^3)}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_k{}^3)}\right)\dots\right)\right), \emptyset^{k-1}{}_{(t_0)}\right] * \dots *$$
$$M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_{k-1}{}^1)}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_k{}^1)}\right)\dots\right)\right), \emptyset^{k-1}{}_{(t_0)}\right]$$
$$\vdots$$
$$\vdots$$
$$\geq M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_0{}^2)}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_1{}^2)}\right)\dots\right)\right), t_0\right]^{n^{k-1}} *$$
$$M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_0{}^3)}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_1{}^3)}\right)\dots\right)\right), t_0\right]^{n^{k-1}} * \dots\dots *$$
$$M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_0{}^1)}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_1{}^1)}\right)\dots\right)\right), t_0\right]^{n^{k-1}}$$

Continue this process, as the same way we get

$$M\left[g_1\left(g_2(\dots\dots(g_{n(x_k{}^n)})\dots)\right), g_1\left(g_2(\dots\dots(g_{n(x_{k+1}{}^n)})\dots)\right), \emptyset^k{}_{(t_0)}\right]$$
$$\geq M\left[g_1\left(g_2(\dots\dots(g_{n(x_0{}^n)})\dots)\right), g_1\left(g_2(\dots\dots(g_{n(x_1{}^n)})\dots)\right), t_0\right]^{n^{k-1}} *$$
$$M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_0{}^1)}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_1{}^1)}\right)\dots\right)\right), t_0\right]^{n^{k-1}} * \dots\dots *$$
$$M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_0{}^{n-1})}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_1{}^{n-1})}\right)\dots\right)\right), t_0\right]^{n^{k-1}}$$

Now, by using above inequalities and for each $n_0 \leq n < m$, we have

$$M\left[g_1\left(g_2(\dots\dots(g_{n(x_k{}^n)})\dots)\right), g_1\left(g_2(\dots\dots(g_{n(x_m{}^n)})\dots)\right), \sum_{k=n_0}^{\infty} \emptyset^k{}_{(t_0)}\right]$$

$$\geq M\left[g_1\left(g_2(\dots\dots(g_{n(x_k{}^n)})\dots)\right), g_1\left(g_2(\dots\dots(g_{n(x_m{}^n)})\dots)\right), \sum_{k=n_0}^{m-1} \emptyset^{k+1}{}_{(t_0)}\right]$$

$$\geq M\left[g_1\left(g_2(\dots\dots(g_{n(x_k{}^n)})\dots)\right), g_1\left(g_2(\dots\dots(g_{n(x_{k+1}{}^n)})\dots)\right), \emptyset^k{}_{(t_0)}\right] *$$

$$M\left[g_1\left(g_2(\dots\dots(g_{n(x_{k+1}{}^n)})\dots)\right), g_1\left(g_2(\dots\dots(g_{n(x_{k+2}{}^n)})\dots)\right), \emptyset^{k+1}{}_{(t_0)}\right] * \dots *$$

$$M\left[g_1\left(g_2(\dots\dots(g_{n(x_{m-1}{}^n)})\dots)\right), g_1\left(g_2(\dots\dots(g_{n(x_m{}^n)})\dots)\right), \emptyset^{m-1}{}_{(t_0)}\right]$$

$$\vdots$$

$$\vdots$$

$$\geq M\left[g_1\left(g_2(\dots\dots(g_{n(x_0{}^n)})\dots)\right), g_1\left(g_2(\dots\dots(g_{n(x_1{}^n)})\dots)\right), t_0\right]^{n^{k-1}} *$$

$$M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_0{}^1)}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_1{}^1)}\right)\dots\right)\right), t_0\right]^{n^{k-1}} * \dots\dots *$$

$$M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_0{}^{n-1})}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_1{}^{n-1})}\right)\dots\right)\right), t_0\right]^{n^{k-1}} *$$

$$M\left[g_1\left(g_2(\dots\dots(g_{n(x_0{}^n)})\dots)\right), g_1\left(g_2(\dots\dots(g_{n(x_1{}^n)})\dots)\right), t_0\right]^{n^k} *$$

$$M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_0{}^1)}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_1{}^1)}\right)\dots\right)\right), t_0\right]^{n^k} * \dots\dots *$$

$$M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_0{}^{n-1})}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_1{}^{n-1})}\right)\dots\right)\right), t_0\right]^{n^k} * \dots *$$

$$M\left[g_1\left(g_2(\dots\dots(g_{n(x_0{}^n)})\dots)\right), g_1\left(g_2(\dots\dots(g_{n(x_1{}^n)})\dots)\right), t_0\right]^{n^{m-2}} *$$

$$M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_0{}^1)}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_1{}^1)}\right)\dots\right)\right), t_0\right]^{n^{m-2}} * \dots\dots *$$

$$M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_0{}^{n-1})}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_1{}^{n-1})}\right)\dots\right)\right), t_0\right]^{n^{m-2}}$$

Let $l = \max\{n^{k-1}, n^k, n^{m-2}\}$

$$\geq M\left[g_1\left(g_2(\dots\dots(g_{n(x_0{}^n)})\dots)\right), g_1\left(g_2(\dots\dots(g_{n(x_1{}^n)})\dots)\right), t_0\right]^l *$$

$$M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_0{}^1)}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_1{}^1)}\right)\dots\right)\right), t_0\right]^l * \dots\dots *$$

$$M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_0{}^{n-1})}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_1{}^{n-1})}\right)\dots\right)\right), t_0\right]^l *$$

$$M\left[g_1\left(g_2(\dots\dots(g_{n(x_0{}^n)})\dots)\right), g_1\left(g_2(\dots\dots(g_{n(x_1{}^n)})\dots)\right), t_0\right]^l *$$

$$M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_0{}^1)}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_1{}^1)}\right)\dots\right)\right), t_0\right]^l * \dots\dots *$$

$$M\left[g_1\left(g_2(\dots\dots(g_{n(x_0{}^n)})\dots)\right), g_1\left(g_2(\dots\dots(g_{n(x_1{}^n)})\dots)\right), t_0\right]^l *$$

$$M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_0{}^1)}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_1{}^1)}\right)\dots\right)\right), t_0\right]^l * \dots\dots *$$

$$M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_0{}^{n-1})}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_1{}^{n-1})}\right)\dots\right)\right), t_0\right]^l$$

$$> M\left[g_1\left(g_2(\dots\dots(g_{n(x_0{}^n)})\dots)\right), g_1\left(g_2(\dots\dots(g_{n(x_1{}^n)})\dots)\right), t_0\right]^{ml} *$$

$$M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_0{}^1)}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_1{}^1)}\right)\dots\right)\right), t_0\right]^{ml} * \dots\dots *$$

$$M\left[g_1\left(g_2\left(\dots\dots\left(g_{n(x_0{}^{n-1})}\right)\dots\right)\right), g_1\left(g_2\left(\dots\dots\left(g_{n(x_1{}^{n-1})}\right)\dots\right)\right), t_0\right]^{ml}$$

$$\geq (1-\mu) * (1-\mu) * \dots\dots * (1-\mu) \geq (1-Ƙ)$$

And hence,

$$M\left[g_1\left(g_2(\dots\dots(g_{n(x_k{}^n)})\dots)\right), g_1(g_2(\dots\dots(g_{n(x_m{}^n)})\dots), t)\right] > (1-Ƙ)$$

So, $< g_1\left(g_2(\dots\dots(g_{n(x_k{}^n)})\dots)\right) >$ is Cauchy sequence.

As the same way, we get

$$< g_1\left(g_2\left(\dots\dots\left(g_{n(x_k{}^1)}\right)\dots\right)\right) >, < g_1\left(g_2\left(\dots\dots\left(g_{n(x_k{}^2)}\right)\dots\right)\right) > and$$

$< g_1\left(g_2\left(\dots\dots\left(g_{n(x_k{}^{n-1})}\right)\dots\right)\right) >$ are Cauchy sequences

Now, to prove that the mappings in A and B have $(G.n)$ – tuplet coincidence fixed point.

Since $g_1\left(g_2(\ldots\ldots(g_{n(X)})\ldots)\right)$ is complete subspace of X then there exists $x_1,x_2,\ldots\ldots,x_n \in g_1\left(g_2(\ldots\ldots(g_{n(X)})\ldots)\right)$ and $a_1,a_2,\ldots\ldots,a_n \in X$ such that

$$\lim_{k\to\infty} g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_k{}^1)}\right)\ldots\right)\right) = \lim_{k\to\infty} f_1\left(f_2\left(\ldots\left(f_{n(x_{k-1}{}^1,\ldots,x_{k-1}{}^n)}\right)\ldots\right)\right) \to g_1\left(g_2\left(\ldots\ldots\left(g_{n(a_1)}\right)\ldots\right)\right) = x_1$$

$$\lim_{k\to\infty} g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_k{}^2)}\right)\ldots\right)\right) = \lim_{k\to\infty} f_1\left(f_2\left(\ldots\left(f_{n(x_{k-1}{}^2,\ldots,x_{k-1}{}^1)}\right)\ldots\right)\right) \to g_1\left(g_2\left(\ldots\ldots\left(g_{n(a_2)}\right)\ldots\right)\right) = x_2$$

$$\vdots$$

$$\lim_{k\to\infty} g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_k{}^n)}\right)\ldots\right)\right) = \lim_{k\to\infty} f_1\left(f_2\left(\ldots\left(f_{n(x_{k-1}{}^n,\ldots,x_{k-1}{}^{n-1})}\right)\ldots\right)\right) \to g_1\left(g_2\left(\ldots\ldots\left(g_{n(a_n)}\right)\ldots\right)\right) = x_n$$

$$M\left[f_1\left(f_2\left(\ldots\left(f_{n(x_{k-1}{}^1,x_{k-1}{}^2,\ldots,x_{k-1}{}^n)}\right)\ldots\right)\right), f_1\left(f_2\left(\ldots\left(f_{n(a_1,a_2,\ldots,a_n)}\right)\ldots\right)\right), \emptyset_{(t)}\right]$$
$$\geq M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_{k-1}{}^1)}\right)\ldots\right)\right), g_1\left(g_2\left(\ldots\ldots\left(g_{n(a_1)}\right)\ldots\right)\right), t\right] *$$
$$M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_{k-1}{}^2)}\right)\ldots\right)\right), g_1\left(g_2\left(\ldots\ldots\left(g_{n(a_2)}\right)\ldots\right)\right), t\right] * \ldots *$$
$$M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_{k-1}{}^n)}\right)\ldots\right)\right), g_1\left(g_2\left(\ldots\ldots\left(g_{n(a_n)}\right)\ldots\right)\right), t\right]$$

As $n\to\infty$ and by continuity of M, we get

$$M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(a_1)}\right)\ldots\right)\right), f_1\left(f_2\left(\ldots\left(f_{n(a_1,a_2,\ldots,a_n)}\right)\ldots\right)\right), \emptyset_{(t)}\right] = 1$$

Also, $M\left[f_1\left(f_2\left(\ldots\left(f_{n(x_{k-1}{}^2,x_{k-1}{}^3,\ldots,x_{k-1}{}^1)}\right)\ldots\right)\right), f_1\left(f_2\left(\ldots\left(f_{n(a_1,a_2,\ldots,a_n)}\right)\ldots\right)\right), \emptyset_{(t)}\right]$

$$\geq M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_{k-1}{}^2)}\right)\ldots\right)\right), g_1\left(g_2\left(\ldots\ldots\left(g_{n(a_2)}\right)\ldots\right)\right), t\right] *$$
$$M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_{k-1}{}^3)}\right)\ldots\right)\right), g_1\left(g_2\left(\ldots\ldots\left(g_{n(a_3)}\right)\ldots\right)\right), t\right] * \ldots *$$
$$M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_{k-1}{}^1)}\right)\ldots\right)\right), g_1\left(g_2\left(\ldots\ldots\left(g_{n(a_1)}\right)\ldots\right)\right), t\right]$$

As $n\to\infty$,

$$M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(a_2)}\right)\ldots\right)\right), f_1\left(f_2\left(\ldots\left(f_{n(a_2,a_3,\ldots,a_n)}\right)\ldots\right)\right), \emptyset_{(t)}\right] = 1$$

Continuity

$$M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_{k-1}{}^n,x_{k-1}{}^1,\ldots,x_{k-1}{}^{n-1})}\right)\ldots\right)\right), f_1\left(f_2\left(\ldots\left(f_{n(a_n,a_1,\ldots,a_n-1)}\right)\ldots\right)\right), \emptyset_{(t)}\right]$$
$$\geq M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_{k-1}{}^n)}\right)\ldots\right)\right), g_1\left(g_2\left(\ldots\ldots\left(g_{n(a_n)}\right)\ldots\right)\right), t\right] *$$
$$M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_{k-1}{}^1)}\right)\ldots\right)\right), g_1\left(g_2\left(\ldots\ldots\left(g_{n(a_1)}\right)\ldots\right)\right), t\right] * \ldots *$$
$$M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_{k-1}{}^{n-1})}\right)\ldots\right)\right), g_1\left(g_2\left(\ldots\ldots\left(g_{n(a_{n-1})}\right)\ldots\right)\right), t\right]$$

As $n\to\infty$, we get

$$M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(a_n)}\right)\ldots\right)\right), f_1\left(f_2\left(\ldots\left(f_{n(a_n,a_1,\ldots,a_{n-1})}\right)\ldots\right)\right), \emptyset_{(t)}\right] = 1$$
$$\Rightarrow g_1\left(g_2\left(\ldots\ldots\left(g_{n(a_1)}\right)\ldots\right)\right) = f_1\left(f_2\left(\ldots\left(f_{n(a_1,a_2,\ldots,a_n)}\right)\ldots\right)\right) = x_1$$
$$g_1\left(g_2\left(\ldots\ldots\left(g_{n(a_2)}\right)\ldots\right)\right) = f_1\left(f_2\left(\ldots\left(f_{n(a_2,a_3,\ldots,a_1)}\right)\ldots\right)\right) = x_2$$
$$\vdots$$
$$g_1\left(g_2\left(\ldots\ldots\left(g_{n(a_n)}\right)\ldots\right)\right) = f_1\left(f_2\left(\ldots\left(f_{n(a_n,\ldots,a_{n-1})}\right)\ldots\right)\right) = x_n$$

Therefore, $(a_1,a_2,\ldots\ldots,a_n)$ is$(G.n)-$ tupled coincidence point of compose the mappings of A and B.

Corollary(2)

Let $(X,M,*)$ be a fuzzy metric space .Under the same assumptions of theorem(1) but

$$M[f_1\left(f_2\left(\ldots\ldots\left(f_{n(x_1,x_2,\ldots,x_n)}\right)\ldots..\right)\right), f_1\left(f_2\left(\ldots\ldots\left(f_{n(y_1,y_2,\ldots,y_n)}\right)\ldots..\right)\right), kt] \geq$$
$$M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_1)}\right)\ldots..\right)\right), g_1\left(g_2\left(\ldots\ldots\left(g_{n(y_1)}\right)\ldots..\right)\right), t\right] *$$
$$M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_2)}\right)\ldots..\right)\right), g_1\left(g_2\left(\ldots\ldots\left(g_{n(y_2)}\right)\ldots..\right)\right), t\right] * \ldots\ldots *$$
$$M\left[g_1\left(g_2\left(\ldots\ldots\left(g_{n(x_n)}\right)\ldots..\right)\right), g_1\left(g_2\left(\ldots\ldots\left(g_{n(y_n)}\right)\ldots..\right)\right), t\right] \ldots\ldots(1)$$

Where $k\in(0,1)$, $t>0$ and $x_i,y_i\in X \quad \forall\, i=1,2,\ldots\ldots,n$.Then there exists a unique $(G.n)-$ tupled coincidence point of compose the mappings of A and B.

Corollary(3)

Let $(X,M,*)$ be a fuzzy metric space .Under the same assumptions of theorem(1) but

$$M\left[f_1\left(f_2(\dots\dots(f_{n(x_1,x_2,\dots,x_n)})\dots..)\right), f_1\left(f_2(\dots\dots(f_{n(y_1,y_2,\dots,y_n)})\dots..)\right), \emptyset(t)\right] \geq M\left[g_1\left(g_2(\dots\dots(g_{n(x_1)})\dots..)\right), g_1\left(g_2(\dots\dots(g_{n(y_1)})\dots..)\right), t\right]^{a_1} * M\left[g_1\left(g_2(\dots\dots(g_{n(x_2)})\dots..)\right), g_1\left(g_2(\dots\dots(g_{n(y_2)})\dots..)\right), t\right]^{a_2} * \dots\dots * M\left[g_1\left(g_2(\dots\dots(g_{n(x_n)})\dots..)\right), g_1\left(g_2(\dots\dots(g_{n(y_n)})\dots..)\right), t\right]^{a_n} \quad (1)$$

Where $\sum_{i=1}^{n} a_i \leq 1,\ t > 0$ and $x_i, y_i \in X \quad \forall\, i = 1,2,\dots\dots,n$.Then there exists a unique $(G.n)$– tupled coincidence point of compose the mappings of A and B.

Corollary(4)

Let $(X, M,*)$ be a fuzzy metric space .Under the same assumptions of theorem(1) but

$$M\left[f_1\left(f_2(\dots\dots(f_{n(x_1,x_2,\dots,x_n)})\dots..)\right), f_1\left(f_2(\dots\dots(f_{n(y_1,y_2,\dots,y_n)})\dots..)\right), kt\right] \geq M\left[g_1\left(g_2(\dots\dots(g_{n(x_1)})\dots..)\right), g_1\left(g_2(\dots\dots(g_{n(y_1)})\dots..)\right), t\right]^{a_1} * M\left[g_1\left(g_2(\dots\dots(g_{n(x_2)})\dots..)\right), g_1\left(g_2(\dots\dots(g_{n(y_2)})\dots..)\right), t\right]^{a_2} * \dots\dots * M\left[g_1\left(g_2(\dots\dots(g_{n(x_n)})\dots..)\right), g_1\left(g_2(\dots\dots(g_{n(y_n)})\dots..)\right), t\right]^{a_n} \quad (1)$$

Where $\sum_{i=1}^{n} a_i \leq 1, k \in (0,1)$, and $x_i, y_i \in X \quad \forall\, i = 1,2,\dots\dots,n$.Then there exists a unique $(G.n)$– tupled coincidence point of compose the mappings of A and B.

Corollary (5)

Let $(X, M,*)$ be a fuzzy metric space .Under the same assumptions of theorem(1) but

$$M\left[f_1\left(f_2(\dots\dots(f_{n(x_1,x_2,\dots,x_n)})\dots..)\right), f_1\left(f_2(\dots\dots(f_{n(y_1,y_2,\dots,y_n)})\dots..)\right), kt\right] \geq M[x_1, y_1, t] * M[x_2, y_2, t] * \dots\dots * M[x_n, y_n, t]$$

Where $k \in (0,1),\ t > 0$ and $x_i, y_i \in X \quad \forall\, i = 1,2,\dots\dots,n$.Then there exists a unique $(G.n)$ – tupled fixed point of compose the mappings in A

Corollary (6)

Let $(X, M,*)$ be a fuzzy metric space .Under the same assumptions of theorem(1) but

$$M\left[f_1\left(f_2(\dots\dots(f_{n(x_1,x_2,\dots,x_n)})\dots..)\right), f_1\left(f_2(\dots\dots(f_{n(y_1,y_2,\dots,y_n)})\dots..)\right), \emptyset(t)\right] \geq M\left[g_1\left(g_2(\dots\dots(g_{n(x_1)})\dots..)\right), g_1\left(g_2(\dots\dots(g_{n(y_1)})\dots..)\right), t\right]^{a_1} * M\left[g_1\left(g_2(\dots\dots(g_{n(x_2)})\dots..)\right), g_1\left(g_2(\dots\dots(g_{n(y_2)})\dots..)\right), t\right]^{a_2} * \dots\dots * M\left[g_1\left(g_2(\dots\dots(g_{n(x_n)})\dots..)\right), g_1\left(g_2(\dots\dots(g_{n(y_n)})\dots..)\right), t\right]^{a_n}$$

Where $\sum_{i=1}^{n} a_i \leq 1,\ t > 0$ and $x_i, y_i \in X \quad \forall\, i = 1,2,\dots\dots,n$.Then there exists a unique $(G.n)$ – tupled fixed point of compose the mappings in A .

Corollary (7)

Let $(X, M,*)$ be a fuzzy metric space .Under the same assumptions of theorem(1) but

$$M\left[f_1\left(f_2(\dots\dots(f_{n(x_1,x_2,\dots,x_n)})\dots..)\right), f_1\left(f_2(\dots\dots(f_{n(y_1,y_2,\dots,y_n)})\dots..)\right), kt\right] \geq M[x_1, y_1, t]^{a_1} * M[x_2, y_2, t]^{a_2} * \dots\dots * M[x_n, y_n, t]^{a_n}$$

Where $\sum_{i=1}^{n} a_i \leq 1, k \in (0,1)$, and $x_i, y_i \in X \quad \forall\, i = 1,2,\dots\dots,n$.Then there exists a unique $(G.n)$ – tupled fixed of compose the mappings in A.

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