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# SOME SPECIAL CLASSES OF NAGENDRAM Γ-SEMI SUB NEAR-FIELD SPACES OF A Γ-NEAR-FIELD SPACE OVER NEAR-FIELD

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***ABSTRACT***

*In this paper author solely introduces the concept of fuzzy complex near-field spaces, fuzzy near matrix near-field, fuzzy polynomial near-field space, special fuzzy near-field space and fuzzy non-associative complex near-field spaces of Nagendram Γ-semi sub near-field spaces of a Γ-near-field space over near-field and studies them.*

*All these concepts are far from the conventional way of defining the same. Hence we in this section define these five types of fuzzy near-field spaces and study some of its interesting properties.*

***Keywords:*** *sub representation, representation,Γ-near-field space; Γ-Semi sub near-field space of Γ-near-field space; Semi near-field space of Γ-near-field space, Nagendram Γ-semi sub near-field space, smooth, space deformation retracts, Nagendram Γ-semi near-field space, closed Nagendram Γ-semi sub near-field spaces of a Γ-near-field space over near-field.*

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## SECTION 1: Some special classes of Nagendram Γ-semi sub near-field spaces of a Γ-near-field space over near-field.

**Definition 1.1:** Let $Q_{n \times n}$ denote the set of all n x n matrices with entries from [0, 1] i.e., $Q_{n \times n} = \{ [a_{ij} : a_{ij} \in [0, 1] \}$ for any two matrices A, B $\in Q_{n \times n}$ define $\oplus$ as follows:

$$A = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \dots & \dots & \dots & \dots \\ a_{n1} & a_{n2} & \dots & a_{nn} \end{bmatrix} \text{ and } B = \begin{bmatrix} b_{11} & b_{12} & \dots & b_{1n} \\ b_{21} & b_{22} & \dots & b_{2n} \\ \dots & \dots & \dots & \dots \\ b_{n1} & b_{n2} & \dots & b_{nn} \end{bmatrix}$$

$$A \oplus B = \begin{bmatrix} a_{11}+b_{11} & a_{12}+b_{12} & \dots & a_{1n}+b_{11} \\ a_{21}+b_{21} & a_{22}+b_{22} & \dots & a_{2n}+b_{21} \\ \dots & \dots & \dots & \dots \\ a_{n1}+b_{11} & a_{n2}+b_{11} & \dots & a_{nn}+b_{11} \end{bmatrix}$$

$$\text{where } a_{ij+} b_{ij} = \begin{cases} a_{ij}+b_{ij} & if \quad a_{ij}+b_{ij} < 1 \\ 0 & if \quad a_{ij}+b_{ij} = 1 \\ a_{ij}+b_{ij}-1 & if \quad a_{ij}+b_{ij} > 1 \end{cases}$$

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Clearly, ($Q_{n\times n}$, ⊕) is an abelian group and $0 = \begin{bmatrix} 0 & 0 & \dots & 0 \\ 0 & 0 & \dots & 0 \\ \dots & \dots & \dots & \dots \\ 0 & 0 & \dots & 0 \end{bmatrix}$

is zero matrix which acts as the additive identity with respect to ⊕.

Define ⊗ on $Q_{n\times n}$ as follows. For A, B ∈ $Q_{n\times n}$

$$A \otimes B = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{11n} \\ a_{11} & a_{12} & \dots & a_{1n} \\ \dots & \dots & \dots & \dots \\ a_{n1} & a_{n2} & \dots & a_{nn} \end{bmatrix} \otimes \begin{bmatrix} b_{11} & b_{12} & \dots & b_{11n} \\ b_{11} & b_{12} & \dots & b_{1n} \\ \dots & \dots & \dots & \dots \\ b_{n1} & b_{n2} & \dots & b_{nn} \end{bmatrix}$$

$$= \begin{bmatrix} a_{11} + \dots + a_{1n} & \dots & a_{11} + \dots & \dots + a_{1n} \\ a_{21} + \dots + a_{2n} & \dots & a_{21} + \dots & \dots + a_{2n} \\ \dots & \dots & \dots & \dots \\ a_{2n} + \dots + a_{nn} & \dots & a_{n1} + \dots & \dots + a_{nn} \end{bmatrix}$$

where $a_{ij} . b_{ij} = a_{ij}$ for all $a_{ij} \in$ A and $b_{ij} \in$ B. Clearly, ($Q_{n\times n}$, ⊗ ) is a nagendram gamma semi sub near-field space. Thus (A ⊕ B) ⊗ C = A ⊗ C ⊕ B ⊗ C. Hence ($Q_{n\times n}$, ⊕, ⊗ ) is a nagendram gamma near-field space. Which we call as the fuzzy matrix nagendram gamma near-field space.

**Definition 1.2:** In ($Q_{n\times n}$, ⊕, ⊗) be a fuzzy matrix nagendram gamma near-field space we say a fuzzy matrix nagendram gamma sub near-field space I of $Q_{n\times n}$ is a fuzzy left ideal of $Q_{n\times n}$ if

a. (I , +) is a normal subgroup of Q n x n

b. $n(n^{|} + i) + n_r n^{|} \in$ I for each $i \in$ I and $n_r$, n, $n^{|} \in$ N where $n_r$ denotes the unique right inverse of n.

**Note 1.3:** All properties enjoyed by near-field spaces can be defined and will be true with appropriate modifications.

Now we proceed on to define the concept of fuzzy complex nagendram gamma near-field spaces.

**Definition 1.4:** Let U = {a +*i* b: a, b ∈ [0, 1]} define on U the operation called addition denoted by ⊕ s follows:
For a + *i* b, $a_l + ib_l \in$ U, a + *i* b ⊕ $a_l + ib_l$ = $a + a_l + i(b + b_l)$ where a ⊕ $a_l = a + a_l$ if $a + a_l < 1$ and $a + a_l = a + a_l - 1$ if $a + a_l \geq 1$ where "+" is the usual addition of numbers. Clearly, (U, ⊕) is a field.

Define ⊗ on U by (a + *i b*) ⊗ ($a_l + ib_l$) = a + *i* b for all ∈are fuzzy complex nagendram gamma sub near-field spaces of (U, ⊕, ⊗) a + *i* b, $a_l + ib_l \in$ U. (U, ⊗ ) is a nagendram gamma semi sub near-field space. It is easily verified. (U, ⊕, ⊗) is a nagendram gamma near-field space, which we call as the fuzzy complex nagendram gamma near-field space.

**Note 1.5:** Q = {a: a ∈ [0, 1]} and C = {*ib:* b ∈ [0, 1]} are fuzzy complex nagendram gamma sub near-field spaces of (U, ⊕, ⊗ ).

**Definition 1.6:** Let V = {a + *i*b: a, b ∈ [0, 1]} called the set of fuzzy complex numbers} Define on V two binary operations ⊕ and ⊗ as follows:
(V, ⊕) is a commutative loop where a + *i*b, c + *id*∈ V define a + *i*b⊕ c + *id* = a ∼ c + *i* (b ∼ d) where ∼ is the difference between a and b. Clearly (V, ⊕) is a commutative loop.

Define ⊗ on V by a + *i*b ⊗ c + *id* = a + *i* b for all a + *i*b, c + *id*∈ V. (V, ⊕, ⊗) is called the fuzzy complex non-associative nagendram gamma near-field space. ([0, 1], ⊕, ⊗) ⊆ (V, ⊕, ⊗ ) is a fuzzy non-associative nagendram gamma sub near-field space.

**Definition 1.7:** Let N be the set of real number. The fuzzy polynomial nagendram gamma sub near-field space $N[x^{[0,\ 1]}]$ consist of elements of the form $p_0 + p_1 x^{r1} + p_2 x^{r2} + \ldots + p_n x^{rn}$ where $p_0, p_1, p_2, \ldots, p_n \in$ N and $\gamma_1, \gamma_2, \ldots \gamma_n \in [0, 1]$ with $\gamma_1 < \gamma_2 < \ldots < \gamma_n$
Two elements p(x) = q(x) ⇔ $p_i = q_i$. and $\gamma_1 = s_i$ where $p(x) = p_0 + p_1 x^{r1} + p_2 x^{r2} + \ldots + p_n x^{rn}$ and $q(x) = q_0 + q_1 x^{s1} + q_2 x^{s2} + \ldots + q_n x^{sn}$. Addition is performed as in the case of usual polynomials.
Define ⊗ on N $[x^{[0,\ 1]}]$ by p(x) ⊗ q(x) = p(x) for p(x), q(x) ∈ N $[x^{[0,\ 1]}]$. Clearly {N$[x^{[0,\ 1]}$, +, ⊗} is called the fuzzy right polynomial nagendram gamma near-field space. $x^0 = 1$ by definition.

**Definition 1.8:** Let {N $[x^{[0, 1]}$, +, ⊗}be a fuzzy polynomial nagendram gamma near-field space. for any polynomial p(x) ∈ N $[x^{[0, 1]}]$ define the derivative of p(x) as follows.

If $p(x) = p_0 + p_1 x^{s1} + p_2 x^{s2} + \ldots + p_n x^{sn}$ and on differentiation p(x) w.r.t. x we get $d[p(x)]/dx = 0 + p_1 x^{s1-1} + p_2 x^{s2-1} + \ldots\ldots + p_n x^{sn-1} = (s_1 p_1) x^{s1-1} + \ldots\ldots.. + (s_n p_n) x^{s1-1}$. Where "~" denotes the difference between $s_i$ and 1. Clearly, if p(x) ∈N $[x^{[0, 1]}]$ then d[p(x)]/dx ∈N $[x^{[0, 1]}]$. Likewise successive derivatives are also defined i.e., product of $s_i$ $p_i$∈ N as $s_i$∈ 0, 1] and $p_i$∈ N i.e., the usual multiplication of the real numbers.

**Example 1.9:** Let N be the set of real numbers N [ $x^{[0, 1]}$ ] be a polynomial nagendram gamma near-field space.
$p(x) = 5 – 6 x^{1/5} + 2 x^{3/8} – 15 x^{7/9}$ then on differentiation p(x) w.r.t. x we get,
$d[p(x)]/dx = 0 – 1/5\ 6.x^{4/5} + 2 x3 /8\ x^{5/8} – 15 x\ 7/9\ x^{2/9} = - 6/5\ x^{4/5 +} ¾\ x^{5/8} – 35/3\ x^{2/9}$

The observation to be made is that no polynomial other than the polynomial x vanishes after differentiation.

**Definition 1.10:** Let p(x) ∈ {N $[x^{[0,1]}$} the fuzzy degree of polynomial nagendram gamma near-field space p(x) is $s_n$ where $p(x) = p_0 + p_1 x^{s1} + p_2 x^{s2} + \ldots\ldots + p_n x^{sn}$, $s_1 < s_2 < \ldots < s_n$ ($p_n \neq 0$) deg p(x) = $s_n$. The maximal degree of any polynomial p(x) can take is 1. Now it is important to note that as in the case polynomial fields we cannot say deg [p(x).q(x)] = deg p(x) + deg q(x).

But we have always in fuzzy polynomial nagendram gamma near-field space is a fuzzy degree we shall denote then by *f* (deg (p(x)).

**Definition 1.11:** Let p(x) ∈ $[N[x^{[0,1]}]$ - p(x) is said to have a root α if p(α) = 0.

**Example 1.12:** Let $p(x) = \sqrt{2} – x^{1/2}$ be a polynomial in N $[x^{[0, 1]}$ ]. The root of p(x) is 2 for $p(2) = \sqrt{2} – 2^{1/2} = 0$.

In case of root of polynomial nagendram gamma near-field space of degree n has n only n roots which is the fundamental theorem of algebra. We in case of fuzzy polynomial nagendram gamma near-field spaces cannot say the number of roots in a nice mathematical terminology that is itself fuzzy.

A study of these fuzzy polynomial nagendram gamma near-field spaces over a nearfield N is left open for any interested upcoming researchers and scholars. We proceed on to define fuzzy polynomial nagendram gamma near-field spaces when the number of variables is more than one x and y.

**Definition 1.13:** Let N be the set of real numbers x, y be two variables we first assume xy = yx. Define the fuzzy polynomial nagendram gamma near-field space.

N $[x^{[0, 1]}, y^{[0, 1]}]$ by = $\{\sum r_i x^{pi} y^{qi} : r_i \in N_i ; p_i \in [0, 1], q_i \in [0, 1]\}$

Define "+" as in the case of polynomial and "." By p(xy). q(x.y) = p(x, y). Clearly, N $[x^{[0, 1]}, y^{[0, 1]}]$ is called as fuzzy polynomial nagendram gamma right near-field space.

**Definition 1.14:** Let {N $[x^{[0, 1]}, y^{[0, 1]}]$ ⊕ "."} be a fuzzy polynomial nagendram gamma right near-field space in the variable x and y.

**Definition 1.15: homogeneous of fuzzy polynomial nagendram gamma right near-field space degree.** A fuzzy polynomial nagendram gamma near-field space p(x, y) is said to be homogeneous of fuzzy polynomial nagendram gamma right near-field space degree t, t ∈ [0, 1] if $p(x, y) = a_n x^{s1} y^{t1} + \ldots\ldots. + b_n x^{sp} y^{tp}$ then $t_i \neq 0$, $s_i \neq 0$ for all I = 1, 2, 3,….,p and $s_i + t_i = t$ for I = 1, 2, 3,…..,p.

**Definition 1.16: symmetric fuzzy polynomial nagendram gamma near-field space.** Let N $\{x^{[0, 1]}, y^{[0, 1]}, \oplus, \otimes\}$ be the fuzzy nagendram gamma near-field space is a homogeneous polynomial nagendram gamma near-field space of fuzzy degree t, t ∈ [0, 1] such that $p(x, y) = p_1 x^{t1} y^{s1} + \ldots\ldots. + p_n x^{tm} y^{sn}$ where $t_1 < t_2 < \ldots. < t_n s_n < s_{n-1} < \ldots < s_1$ with $t_1 = s_n$, $t_2 = s_{n-1}$, …., $t_n = s_1$ further $p_1 = p_n$, $p_2 = p_{n-1}$, so on.

**Example 1.17:** $p(x, y) = 3 x^{1/2} y^{1/2} + 3 x^{2/3} y^{1/2}$ .$p(x, y) = x^r y^r$ r∈ [0, 1].
$p(x, y) = x^r + y^r + x^s.y^t$ where s + t = 1 and s, t , r ∈ [0, 1].

**Definition 1.18: fuzzy polynomial nagendram gamma near-field space in n-variables.** As we have other polynomials we can extend the fuzzy polynomial nagendram gamma near-field spaces to any number of variables say $X_1, X_2, \ldots, X_n$ under the assumption $X_i X_j = X_j X_i$ and denote it by N $[X_1^{[0, 1]}, X_2^{[0, 1]}, \ldots.., X_n^{[0, 1]}]$ is called the fuzzy polynomial nagendram gamma near-field space in n-variables.

**SECTION 2: FUZZY NON-ASSOCIATIVE POLYNOMIAL NAGENDRAM GAMMA NEAR-FIELD SPACE AND SPECIAL CLASS OF FUZZY NAGENDRAM GAMMA RIGHTNEAR-FIELD SPACE.**

We have introduced the concept of complex near-field space, nagendram gamma sub near-field space, nagendram gamma semi sub near-field space, nagendram gamma near-field space and now we just define yet new notion called fuzzy non-associative nagendram gamma near-field space.

**Definition 2.1: fuzzy non-associative polynomial nagendram gamma near-field space.** Let $\{V, \oplus, \otimes\}$ be the fuzzy non-associative complex nagendram gamma near-field space. Let x be an indeterminate. We define the fuzzy non-associative polynomial nagendram gamma near-field spaceas follows

$V[x] = \{\sum p_i x^i : p_i \in V\}$ we say $p(x), q(x) \in V[x]$ are equal if and only if every coefficient of same power of x is equal i.e., if $p(x) = p_0 + p_1x + \ldots + p_nx^n$ and $q(x) = q_0 + q_1x + \ldots + q_nx^n$. $p(x) = q(x)$ if and only if $p_i = q_i$ for $i = 1, 2, 3, \ldots, n$. Addition is performed as follows $p(x) \oplus q(x) = p_0 \oplus q_0 + \ldots + (p_n \oplus q_n)x^n$ where $\oplus$ is the operation on V. For p(x), q(x) in V [x] define $p(x) \otimes q(x) = p(x)$. Clearly, $\{v[x], \oplus, \otimes\}$ is a fuzzy non-associative complex polynomial nagendram gamma near-field space.

Let us take $Z^0 = Z^+ \cup \{0\}$. Let $p : Z^0 \to V$ be defined by $p(0) = 0$, $p(x) = 1/x$ for $0 \neq x \in Z$.

Clearly, p(z) is a fuzzy non-associative polynomial nagendram gamma sub near-field space of V. thus p is a fuzzy non-associative polynomial nagendram gamma sub near-field space. Let $N = Z^0 \text{ x } Z^0$. Define a map $p_0 : N \to V[x]$ by
$p(0, 0) = 0$.
$p(x, y) = 1/x + 1/y$ where $x \neq 0$, $y \neq 0$.
$p(x, 0) = 1/x$.
$p(0, y) = 1/y$.
Then the map p is a fuzzy non-associative complex nagendram gamma sub near-field space of N.

**Definition 2.2: special fuzzy nagendram gamma right near-field space.**
Let Q = [0, 1] the interval from 0 to 1. Define $\oplus$ and $\otimes$ on Q s follows. For $a, b \in Q$ define $a \oplus b = a + b$ if $a + b < 1$, $a \oplus b = 0$ if $a + b = 1$ and $a \oplus b = a + b - 1$ if $a + b > 1$. Thus $\oplus$ acts as modulo 1. Define $\otimes$ on $a, b \in Q = [0, 1]$ by $a \otimes b = a$; clearly, $(a \oplus b) \otimes c = a \otimes c \oplus b \otimes c = a \oplus b$. clearly, $(Q, \oplus)$ is a nagendram gamma sub near-field space of N and $(Q, \otimes)$ is a nagendram gamma semi sub near-field space of N. Hence $(Q, \oplus, \otimes)$ is a nagendram gamma right near-field space of N.

We recall $\{Q, \oplus, \otimes\}$ the special fuzzy nagendram gamma right near-field space of N.

**Definition 2.3: fuzzy nagendram gamma right near-field space zero symmetric and constant part over nagendram gamma near-field space.**Let $\{Q, \oplus, \otimes\}$ be a fuzzy nagendram gamma near-field space. $Q_0 = \{q \in Q: q.0 = 0\}$ is called the fuzzy nagendram gamma near-field space zero symmetric part and $Q_c = \{n \in Q: n.0 = n\}$ is called the fuzzy nagendram gamma near-field space constant part over nagendram gamma near-field space.

**Definition 2.4: fuzzynagendram gamma right near-field space invariant and fuzzynagendram gamma right near-field space right invariant.** A fuzzy nagendram gamma sub near-field space N of Q is called fuzzy nagendram gamma near-field space invariant if $NQ \subseteq N$ and $QN \subseteq N$ we call fuzzy nagendram gamma sub near-field space N of Q to be a fuzzy nagendram gamma near-field space right invariant if $NP \subset N$.

**Note 2.5:** Every fuzzy nagendram gamma sub near-field space N of Q is fuzzy nagendram gamma near-field space right invariant.

**Definition 2.6:** The set Q = {0, 1} with two binary operations $\oplus$ and $\otimes$ is called fuzzy nagendram gamma right semi near-field space if $\{Q, \oplus\}$ and $\{Q, \otimes\}$ are fuzzy nagendram gamma semi near-field space.

**Example 2.7:** We being all results can be easily extended in case of fuzzy nagendram gamma semi near-field space.
Further, let $\{Q, \oplus, \otimes\}$ be the fuzzy nagendram gamma semi near-field space.
define $\oplus$ as
$p \oplus q = 0$ if $p + q < 1$
$p \oplus q = 1$ if $p + q \geq 1$. Then $(Q, \oplus)$ is a nagendram gamma semi near-field space.
Define $\otimes$ as
$p \otimes q = p$ for all $p, q \in Q$. Clearly, $\{Q, \oplus, \otimes\}$ is a special fuzzy nagendram gamma semi near-field space.

 

## SECTION 3: MAIN RESULTS ON SPECIAL CLASSES OF FUZZY NON-ASSOCIATIVE POLYNOMIAL NAGENDRAM GAMMA NEAR-FIELD SPACE AND SPECIAL CLASS OF FUZZY NAGENDRAM GAMMA RIGHT NEAR-FIELD SPACE.

In this third section, we study and deduce some main results related on special classes of Fuzzy non-associative polynomial nagendram gamma near-field space and special class of fuzzy nagendram gamma right near-field space.

**Theorem 3.1:** The fuzzy matrix nagendram gamma near-field space is a commutative polynomial nagendram gamma near-field space.

**Proof:** with the help of basic definitions one can prove straightforward.

**Theorem 3.2:** The fuzzy matrix nagendram gamma near-field space is not an abelian nagendram gamma near-field space.

**Proof:** for M, N $\in Q_{n \times n}$ we have $M \otimes N \neq N \otimes M$ in general. Hence The fuzzy matrix nagendram gamma near-field space is not an abelian nagendram gamma near-field space. This completes the proof of the theorem.

**Note 3.3:** In $\{Q_{n \times n,} \oplus, \otimes\}$ we have $J_{n \times n} \neq M$ where $J_{n \times n}$ is the fuzzy matrix nagendram gamma near-field space with diagonal elements 1 and rest 0.

**Note 3.4:** W = {a + *i*b: a, b $\in$ [0, 1]} has non-trivial idempotent.

**Note 3.5:** The special fuzzy right nagendram gamma right near-field space $\{Q, \oplus, \otimes\}$ has no fuzzy invertible elements.

**Example 3.6:** Let S = {r/p, 0: 1 < r < p} is a fuzzy nagendram gamma sub near-field space or to be more specific S = {0, ¼, ½, ¾}; S is a fuzzy nagendram gamma sub near-field space.

**Theorem 3.7:** Let $\{W, \oplus, \otimes\}$ be a fuzzy complex nagendram gamma near-field space. Every non-trivial fuzzy nagendram gamma sub near-field space of N is a fuzzy right ideal of W.

**Proof:** It is obvious by the fact that if N is a fuzzy nagendram gamma sub near-field space of W then NW $\subseteq$ N.
It is open question. Does W have non-trivial fuzzy left, right ideals and ideals. The reason that we are to develop new and analogous notions and definitions about the concepts of special classes of Fuzzy non-associative polynomial nagendram gamma near-field space and special class of fuzzy nagendram gamma right near-field space.

Now a natural question would can we have the concept of fuzzy non-associative complex nagendram gamma near-field space; to this end we define a fuzzy non-associative complex nagendram gamma near-field space.

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