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INTUITIONISTIC FUZZY NORMED IDEAL AND ITS CHARACTERISTICS

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Abstract A single paragraph of about 200 words maximum. For research articles, abstracts should give a pertinent overview of the work. We strongly encourage authors to use the following style of structured abstracts, but without headings: (1) Background: place the question addressed in a broad context and highlight the purpose of the study; (2) Methods: describe briefly the main methods or treatments applied; (3) Results: summarize the article's main findings; (4) Conclusion: indicate the main conclusions or interpretations. The abstract should be an objective representation of the article, it must not contain results which are not presented and substantiated in the main text and should not exaggerate the main conclusions.

Intuitionist Fuzzy Normed Ring ; Intuitionist fuzzy normed Ideal ; Fuzzy Prime Ideal ; Fuzzy Normed Prime Ideal.)

1 Introduction

After Zadeh [1] formulate the interception of fuzzy set as ageneralization of acrisp set,that use to establishment of the fuzzy set theory,in 1971 RosenField [2] extended and formulated the notion of fuzzy subgroup of agroup. Later,in [3] Liu introduced the definition of fuzzy ring,fuzzy subring,fuzzy ideals and some related concepts.Swamy in [5],Mukherje and Sen in[7]) and Zhag Yue [8] introduced fuzzy ideals and fuzzy prime ideals,characterized Regular Rings andnotherian Rings by Fuzzy Ideals,determined all fuzzy ideals of a ring of intigers.in 1997 Atanassov [9]presented the idea of the intuitionistic fuzzy set a way to handle uncertainty, while fuzzy set deals with the degree of membership of an element in a given set, intuitionistic fuzzy sets assign both degrees of membership and non-membership with an addition that sum of these degrees should not exceeds 1. In 1992 [10],Dix et al. introduced the notion of intuitionistic fuzzy groups, followed by a study of the properties of intuitionistic fuzzy subgroups and intuitionistic fuzzy subrings conducted by Hur et al. in[11]. Marashdeh and Salleh generalized Dibs notion for fuzzy rings based on the notion of fuzzy space in [14] by applying the notion of fuzzy space to intuitionistic fuzzy space and to introduce related concepts to present a new formulation of intuitionistic fuzzy group and intuitionistic fuzzy ring. In [26],a generalisation of the notion of fuzzy homomorphism and fuzzy normal subgroup based on.fuzzy spaces to intuitionistic fuzzy hyperhomomorphism based on intuitionistic fuzzy spaces to introduce the concept of an intuitionistic fuzzy quotient hypergroup induced by an intuitionistic fuzzy normal subhypergroup. Complex intuitionistic fuzzy ideals were defined and its characteristics were investigated by Alsarahead and Ahmad in [14] and some of its applications were studied in [16] bycombining complex intuitionistic fuzzy sets and graph theory which can be used in the utilization of the complex intuitionistic fuzzy graphs in decision making problems. After studies by Naimark [22]of normed rings, Arens presented [17] the generalization of normed rings and Gelfand defined commutative normed rings in [18] and presented the notion of commutative normed rings. In[19] Jarden characterized the ultrametric absolute value and investigated the properties of normed rings. Gupta and Qi [29] studied T-norms and T-conorm, T-norm, T-conorm and negation function was described as a set of T-operators, some typical T-operators and their mathematical properties were given.in 2016,[28]Backhadech,et al.introduced intuitionistic fuzzy ideal and intuitionistic fuzzy prime ideal in a ring using intuitionistic fuzzy points and membership and non-membership function. Properties of fuzzy normed

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1.1 definition

[29]: The fuzzy set A in a fixed universe X is a function $A : X \rightarrow [0, 1]$, this function is referred to the membership function and denoted by $\mu(z)$. A fuzzy set A is symbolized in the form: $A = (z, \mu_A(z)) :\in X$. For every $z \in X$,$0 \leq \mu_(z) \leq 1$, if $z \notin A$ then $\mu_A(z) = 0$, and if z is fully contained in A then $\mu_A(z) = 1$.

1.2 definition

[25] An intuitionistic fuzzy set (shortly, IFS) A in a nonempty set of X in the form IFS

$$A = (z, \mu_A(z), \gamma_A(z) : z \in X)$$

, where the function of the degree of membership is $\mu_A m(z) : X \longrightarrow [0, 1]$ and the function of the degree of nonmembership is

$$\gamma_A(z) : X \rightarrow [0, 1]$$

where

$$0 \leq \mu_A(z) + \gamma_A(z) \leq 1$$

for every

$$z \in X$$

. We will use the notation $A = (\mu_A, \gamma_A)$ for the IFS.

1.3 defn

[8] Let A be a fuzzy subset of a set X. The set

$$A_a = \mu_A(z) \geq a : z \in X$$

is the level subset of $\mu_A(z)$, where $a \in [0, 1]$.
[25]An intuitionistic fuzzy set (shortly, IFS) A in a nonempty set of X in the form IFS $A = (z, \mu_A(z), \gamma_A(z) : z \in X$, where the function of the degree of membership is $\mu_A(z) : X \rightarrow [0, 1]$ and the function of the degree of nonmembership is

$$\gamma_A(z) : X \rightarrow [0, 1]$$

where

$$0 \leq \mu_A(z) + \gamma_A(z) \leq 1$$

for every $z \in X$. We will use the notation $A = (\mu_A, \gamma_A))$ for the IFS.

1.4 remark

[21]For an intuitionistic fuzzy set $A = (\mu_A(z), \gamma_A(z))$, the support set of A is the subset of X which denoted by: $A = \mu_A(z) \neq 0, \gamma_A(z) \neq 1 : z \in X$.

1.5 definition

[27] Let

$$(R, +, .)$$

be a ring and

$$A = (\mu_A, \gamma_A)$$

be an IFS of R. Then A is an intuitionistic fuzzy subring (in short IFSR) of R if the following are satisfied:

$$i.\mu_A(zq) \geq min(\mu_A(z), \mu_A(q)),$$

$$ii.\mu_A(zq) \geq min(\mu_A(z), \mu_(q)),$$

$$iii.\gamma_A(zq) \leq max(\gamma_A(z), \gamma_A(q)),$$

$$iv.\gamma_A(zq)) \leq max(\gamma_A(z), \gamma_A(q))$$

1.6 definition

[29] Let $(R, +, .)$ be a ring. Then an IFS

$$A = (\mu_A, \gamma_A)$$

of R is an intuitionistic fuzzy ideal (shortly, IFI) in R if:

$$i.\mu_A(zq) \geq min(\mu_A(z), \mu_A(q)),$$

$$ii.\mu_A(zq) \geq max(\mu_A(z), \mu_A(q))$$

,

$$iii.\gamma_A(zq) \leq max(\gamma_A(z), \gamma_A(q)),$$

$$iv.\gamma_A(zq)) \leq min(\gamma_A(z), \gamma_A(q))$$

1.7 definition

[29] A functional defined on a linear space L is a norm if it satisfies the following: $N1 : z \geq 0$ for every $z \in L$, where k $z = 0$ if and only if $z = 0$;

N2: $\delta z = ||$ z $; (and hence =-z$), for all δ and for all $z \in L$; $N3 :$ z+q $\leq$ z $+$ $for all z,$ q $\in L[Triangle inequality]. A normed linear space is linear space L equipped with a norm.$

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1.8 definition

[29] [29]A functional on A Ring A is normed Ring (NR) if it satisfies the following:
$N1 : z \geq = 0$ for every $z \in L$,where $|z = 0$ iff $z = 0$;
$N2 : \dot{\delta(z)} = \dot{\delta(z)}$;hence $z = -z$), for all $/delta$ and for all$z \in L$
$N3 : z + q \leq z + q forall z, q \in L [triangular eniquality]$.

1.9 definition

[29] A function $* : [0,1][0,1] \rightarrow [0,1]$ is a t-norm if it satisfies the following for all $z, q, h \in [0,1]$:
1.$*(z, 1)$ =z ,
2.$*(z, q) \leq *(z, h)$ if $q \leq h$;($*$ is monotone),
3. $*(z, z) < z$ for $z \in (0,1)$, and
4. If$z < h$ and$q < t$then $*(z, q) < *(h, t)$for all $z, q, h, t \in (0,1). We will write z$ $*q$ instead of $*(z, q)$.

1.10 definition

[29] A function $\diamond : [0,1][0,1] \rightarrow [0,1]$ is a s-norm if it satisfies the following for all $z, q, h \in [0,1]$:
1. $\diamond (z, 0) = z$,
2.$\diamond(z, q) \leq \diamond(z, h)$ if $q \leq h$; ($\diamond$ is monotone),
3.$\diamond(z, z) > z$for $z \in (0,1)$, and
4. If $z < h$ and $q < t$ then $\diamond(h, t) \leq \diamond(z, q)$ for all $z, q, h, t \in (0,1)$. We will write $z \diamond q$ instead of (z, q).

1.11 example

[12] [15]The Field of Real Number R is anormed a Ring with respect to the absolute value and the field of complex numbers C is anormed Ring with respect to the modulus. More general examples are the Ring of the Real square matrices with the matrix norm and the ring of real polynomials with a polynomial norm.

1.12 Theorem

[12] Let A and B be two intuitionistic fuzzy ideals of a normed ring NR. Then $A \cap B$ is an intuitionistic fuzzy normed ideal of NR. proof: Let $z, q \in NR$. Then,

$$i.\mu_{A \cap B}(z-q) = min\{\mu_A(z-q), \mu_B(z-q)\} \geq min\{\mu_A(z)*\mu_A(q), \mu_B(z)*\mu_B(q)\}$$

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$$(ii).\mu_{A\cap B}(zq) = min\{\mu_A(zq), \mu_B(zq)\} \geq min\{\mu_A(q), \mu_B(q)\} \geq \mu_{A\cap B}(q)$$

$$\begin{aligned}(iii)\mu_{A\cap B}(z-q) &= maz\{\gamma_A(z-q), \gamma_B(z-q)\} \\ &\leq max\{\gamma_A(z)\Delta\gamma_A(q), \gamma_B(z)\Delta\gamma_B(q)\} \\ &\leq max\{(\gamma_A(z)\Delta\gamma_A(q)), (\gamma_B(z)\Delta\gamma_B(q))\} \\ &\leq \gamma_{A\cap B}(z)\Delta\gamma_{A\cap B}(q)\end{aligned}$$

$$\begin{aligned}(iv)\mu_{A\cap B}(zq) &= maz\{\gamma_A(zq), \gamma_B(zq)\} \\ &\leq max\{\gamma_A(z), \gamma_B(q\} \\ &\leq \mu_{A\cap B}(zq)\end{aligned}$$

Therefore,$A \cap B$ is an intuitionistic fuzzy normed left ideal. Correspondingly it can be proven that $A \cap B$ is an intuitionistic right ideal. So, $A \cap B$ is a intuitionistic fuzzy normed ideal of NR.

Proof Let A be an intuitionistic fuzzy normed ring and 0_{NR} is the zero of the normed ring. Then, for every $z \in NR$:

$$i.\mu_A(z) \leq \mu_A(0), \gamma_A(0) \leq \gamma_A(z),$$

$$ii.\mu_A(z) = \mu_A(z), \gamma_A(z) = \gamma_A(z).$$

1.13 definition

If $A = (\mu_A, \gamma_A)$ and $B = (\mu_B, \gamma_B)$ are two intuitionistic fuzzy normed rings over NR. Then, A is an intuitionistic fuzzy normed subring of B if:

$$i.\mu_A(z) \leq \mu_B(z),$$

$$ii.\gamma_A(z) \geq \gamma_B(z)$$

.

1.14 definition

/cite11 let A be a nonempty intuitionistic fuzzy normed ring. For every $z, q \in NR$, A is an intuitionistic fuzzy normed left (right) ideal if:

$$i.\mu_A(zq) \geq \mu_A(z) * \mu_A(q)$$

$$\begin{aligned}ii.\mu_A(zq) &\geq \mu_A(q)(\mu_A(zq) \geq \mu_A(z)) \\ iii.\gamma_A(zq) &\leq \gamma_A(z)\Delta\gamma_A(q), \\ iv.\gamma_A(zq) &\leq \gamma(q)(\gamma_A(zq) \leq \gamma_A(z)).\end{aligned}$$

.....(1.0)

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1.15 Theorem

[12] If the fuzzy set $A = (\mu_A, \gamma_A)$ is both right and left intuitionistic fuzzy normed ideal of NR. Then A is called intuitionistic fuzzy normed ideal, if for every $z, q \in NR$:

$$i.\mu_A(zq) \geq \mu_A(z) * \mu_A(q),$$

$$ii.\mu_A(zq) \geq \mu_A(z)\Delta\mu_A(q),$$

$$iii.\gamma_A(zq) \leq \gamma_A(z)\Delta\gamma_A(q),$$

$$iv.\gamma_A(zq) \leq \gamma_A(z) * \gamma_A(q). \quad (1.1)$$

1.16 Lemma

Let $1_N R$ be the multiplicative identity in NR then for all$z \in NR$:

$$1.\mu_A(z) \geq \mu_A(1NR),$$

$$2.gA(z)gA(1NR).$$

Proof [6]. Let $z \in NR$. Then $1.\mu_A(z.1NR) \geq mA(z)\Delta mA(1NR) implies \mu_A(z) \geq \mu_A(1NR)$,$2.\gamma_A(z.1NR) \leq \gamma_A(z)\gamma_(1NR) implies gA(z)gA(1NR)$.

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2 Materials and Methods

3 Mathematical Procedure

To overcome Our aim we follow the following steps:
Step 1: Using equation (1.1) as a Governing eqauation
step 2: Defining the equation from (1.2)
step 3: making a condition for the equation (1.1) to become a prime ideal without loosing its generality.
step 4: using equation (1.0)and Equation (1.1) to proof the proposed equation.

4 Results

5 Result

An intuitionistic fuzzy normal ideal $p = (\mu_p, \gamma_p)$ of a Ring R , not necessarily constant is intuitionistic Fuzzy Normed prime Ideal ,if for any intuitionistic fuzzy normed ideal of $A = (\mu_A, \gamma_A)$ and $B = (\mu_B, \mu_B)$ of R, the condition $AB \subset p$ implies that either $A \subset P$ or $B \subset P$.intuitionistic fuzzy ideal Let$\check{R}$be the subset of all intuitionistic fuzzy points of R, and let $\check{A}$ denote the set of all intuitionistic fuzzy points contained in $A = /\mu_A, \gamma_A)$.
. That is,

$$\check{A} = \ X_{(\alpha,(\in \check{R}|\mu_A \geq \alpha and \gamma_A \leq \beta\}..}$$

A $= (\mu_A, \gamma_A)$ is an intuitionistic fuzzy ideal of R if and only if:

$$i.X_{(\alpha,\beta)}, Y_{(\alpha',\beta')} \in (\mu_A, \gamma_A), X_{(\alpha,\beta)} - Y_{(\alpha',\beta')} \in (\mu, \gamma)$$

$$ii.X_{(\alpha,\beta)} \in \check{R}, \forall Y_{(\alpha',\beta')} \in (\mu, \gamma), X_{(\alpha,\beta)} Y_{(\alpha',\beta'} \in (\mu, \gamma)..... \quad (1.2)$$

.

Proof Suppose that $A = (\mu_A, \gamma_A)$.i is an intuitionistic fuzzy ideal, so we have for all

$$X_{(\alpha,\beta)}, Y_{(\alpha',\beta')} \in (\mu_A, \gamma_A), \mu(x - y) \geq \mu(x) * \mu(y) \geq \alpha *$$

and

$$\gamma(xy) \leq \gamma(x) \diamond \gamma(y) \leq \beta \diamond \beta'$$

: Then,

$$X_{(\alpha,\beta)} - Y_{(\alpha',\beta')} = (x - y)_{\alpha * \alpha', \beta \diamond \beta'} \in (\mu_A, \gamma_A)$$

and we have

$$X_{(\alpha,\beta)} \in \check{R}, Y_{(\alpha',\beta')} \in (\mu_A, \gamma_A) : \mu(xy) \geq \mu(x) \diamond \mu(y) \geq \mu(y) \geq alpha' \geq \alpha * \alpha'$$

and
$$\gamma(xy) \leq \gamma(x) * \gamma(y) \leq \gamma(y) \leq \alpha' \leq \alpha \diamond \alpha';$$
hence,
$$(x\dot{y})_{\alpha*\alpha',\beta\diamond\beta')} = X_{(\alpha,\beta)}, Y_{(\alpha',\beta')} \in (\mu_A, \gamma_A)$$
. ($\Longleftarrow$) Let $x, y \in R$. We have
$$x_{(\mu(x)*\mu(y),\gamma(x)\diamond\gamma(y)} \in (\mu, \gamma)$$
. Then,using the assumption we have
$$x_{(\mu(x)*\mu(y),\gamma(x)\diamond\gamma(y))} - y_{(\mu(x)*\mu(y),\gamma(x)\diamond\gamma(y)} \in (\mu, \gamma).$$
Hence, $\mu(x-y) \geq \mu(x) * \mu(y)$ and $\gamma(x-y) \leq \gamma(x) \diamond \gamma(y)$. Let $x, y \in R$, suppose that $\mu(y) \geq \mu(x)$ and $\gamma(x) \geq \gamma(y)$ so for $\alpha = \alpha' = \mu(x) \diamond \mu(y)$, and $\beta = \beta' = \gamma(x) * \gamma(y)$, we have
$$y_{(\alpha\diamond\alpha',\beta*\beta')} \in (\mu, \gamma).$$
.
since $X_{(\alpha\diamond\alpha',\beta*\beta')} \in \check{R}$ implies that
$$x_{(\alpha\diamond\alpha',\beta*\beta')}\dot{y}_{(\alpha\diamond\alpha',\beta*\beta')} \in (\mu, \gamma).$$
Hence,
$$\mu(xy) \geq \mu(x) \diamond \mu(y)$$
and
$$\gamma(xy) \leq \gamma(x) * \gamma(y)$$
. The same is true if
$$\mu(x) \geq \mu(y)$$
and
$$\gamma(x) \geq \gamma(y)$$
.

5.1 Theorem

[28] an intuinistic fuzzy ideal $(\mu, \gamma) of R$ is an intuinistic fuzzy prime ideal if and only if for any two intuinistic fuzzy points
$$X_{(\alpha,\beta)} \in R$$
$$X_{(\alpha,\beta)}\dot{Y}_{(\alpha',\beta')} \in (\mu, \gamma)$$
implies either
$$X_{(\alpha,\beta)} \in (\mu, \gamma) or Y_{(\alpha',\beta')} \in (\mu, \gamma) \tag{1.3}$$

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5.2 Theorem

$\langle \mu, \gamma \rangle$ of R is an intuitionistic fuzzy normed Prime Ideals if and only if

$$i.\mu(x-y) \geq \mu(x) * \mu(y)$$
$$ii.\gamma(x-y) \leq \gamma(x) \Delta \gamma(y)$$
$$iii.\mu(xy) = \mu(x) \Delta \mu(y)$$
$$iv.\gamma(xy) = \gamma(x) * \gamma(y)$$

. (1.3)

Proof let (μ, γ) be an intuinistic fuzzy normed prime ideal.suppose that

$$\mu(xy) > \mu(x) \Delta \mu(y)$$

and

$$\mu(x) \geq \mu(y)$$

, and suppose that

$$\gamma(xy) < \gamma(x) * \gamma(y)$$

and

$$\gamma(x) \leq \gamma(y)$$

then

$$\mu(xy) > \mu(x) \geq \mu(y)$$

and

$$\gamma(xy) < \gamma(x) \leq \gamma(y)$$

which implies that $X_{(\mu(xy),\gamma(xy))} \notin (\mu, \gamma)$ and $Y_{(\mu(xy),\gamma(xy))} \notin (\mu, \gamma)$

Using the Theorem 3.1, we have

$$X_{(\mu(xy),\gamma(xy))}, Y_{(\mu(xy),\gamma(xy))} \notin (\mu, \gamma)$$

Which is absurd(inconsistent), then,

$$\mu(xy) = \mu(x) \Delta \mu(y)$$

and $\gamma(xy) = \gamma(x) * \gamma(y)$

Conversely, let $x_{(\alpha,\beta)}, y_{(\alpha',\gamma')}$ be two intuinistic fuzzy normed points of R, such that $x_{(\alpha,\beta)}, y_{(\alpha',\gamma')} \in (\mu, \gamma)$.

suppose that $x_{(\alpha,\beta)} \notin (\mu, \gamma)$ and $y_{(\alpha',\gamma')} \in (\mu, \gamma)$,$\alpha = \alpha' = \mu(xy)$ and $\beta = \beta' = \gamma(xy)$.

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we have $\mu(x) < \mu(y)$ and $\mu(y) < \mu(xy)$ and$\gamma(x) > \gamma(xy)$. this implies that

$$X_{(\mu(xy),\gamma(xy))} \notin (\mu,\gamma) \& Y_{(\mu(xy),\gamma(xy))} \notin (\mu,\gamma)$$

$X_{(\alpha\Delta\alpha',\beta*\beta')}\dot{y}_(\alpha\Delta\alpha',\beta*\beta') \in (\mu,\gamma)$
hence,

$$\mu(xy) \geq \mu(x)\Delta\mu(y)$$

and

$$\gamma(xy) \leq \gamma(x)\Delta\gamma(y)$$

the same is true for

$$\mu(x) \geq \mu(y)$$

$\gamma(x) \leq \gamma(y)$.

6 Discussion

In previously Reported Findings,Abed Alhalem,et al.,in [12] proposed intuitionistic fuzzy normed ideal as If the fuzzy set $A = (\mu_A, \gamma_A)$ is both right and left intuitionistic fuzzy normed ideal of NR. $\langle\mu,\gamma\rangle$ of R is an intuitionistic fuzzy normed Prime Ideals if and only if
$i.\mu(x-y) \geq \mu(x) * \mu(y)$
$ii.\gamma(x-y) \leq \gamma(x)\Delta\gamma(y)$
$iii.\mu(xy) = \mu(x)\Delta\mu(y)$
$iv.\gamma(xy) = \gamma(x) * \gamma(y)$.
while this ideal doesnot satisfy the prime idealness for $\mu_A(zq) > \mu_A(z)\Delta\mu_A(q)$ and $\gamma_A(zq) \leq \gamma_A(z) * \gamma_A(q)$..By Accepting this Governing equation as a base line, the present study was tried to made the condition of prime ideals of intuitionistic fuzzy normed prime ideals.

7 conclusion and Recommendation

In this study,we try to define the prime ideals of prime ideals of intuitionistic fuzzy normed ideals . beside this we introduced the concept of intuitionistic fuzzy normed ideal using fuzzy points and membership and nonmembership function. In the future, further research could be done to study the intuitionistic fuzzy normed Maximal ideals, and to define their algebraic structures. I suggest some future research to investigate other properties of intuitionistic fuzzy normed rings and to expand their applications.

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