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# Review on BCI/BCK-Algebras and Development

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### Abstract

The aim of the paper is to investigate the relationship between BCK/BCI-algebras and other algebras namely d-algebras, Q-algebras-BCH-algebras-TM-algebras-INK-algebras and we introduce some algebraic system. all the new type of algebras generalized on BCI-algebras.
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**Key Words and Phrases:** BCI/BCK-algebra BCK-algebras-d-algebras-TM-algebras-INK-algebras-sub algebras-ideal-INK-ideal.

## 1    Some Basic Algebras

Imai and Iseki(1996) introduced a class of abstract known as BCK-algebras.At the same time,Iski introducd another class of algebra,called BCI-algebra and Invstigated some of its properties.It is know that the class of BCK-algbra is a proper subclass of the class of BCK-algebra.these two are the important class of the logical algebras. Hu and Li(1985) Introduced a wide class of abstract algebras namely BCH-algebra and showed that the class of BCI-algebra is a proper subclass of the class of BCH-algebra.

Neggers et al(1999) introduced the notion of d-algebra which is also a useful generalization of BCK-algebra.Dudek(1992)introduced a notion of BCC-algebra at the same time,Jun et al(1998)introduced a new notion called BH-algebra,a generalization of BCH/BCI/BCK-algebra.    In addition to that th papers on commutative BCK-algebraby Abujabal(1966),on BCH-algebra by muhammad Anwar chaudhry and Hafiz Fakhar-ud-Din(2001),On Smarandache BCC-algebra by young Bae Jun(2005) and on BCI-algebra by Young Bae Jun et al (2011)have also been duly studied.  Ahn and Kim (1999) introduced another type of algebra QS-algebra,which is also a generalization of BCK/BCI-algebra and obtained several results.  In the same period two they introduced another type of algebra Known as Q-algebras together with Joseph Neggers(1999),which is generalization of BCH/BCI/BCK-algebras.Neggers and kim (2002)introduced the notion of B-algebra.

Michiro Konda(2004)studied on the classes of QS-algebra.Kim and Kim(2005) introduced the notion of BG-algebra which is a generalization of B-algebra.  Jun Y.B and

X.L Xin(2004) Introduced the notion of Derivation of BCI-algebra abd also Introducd new conceptof called a rgular derivation in BCK-algebra then,In(2007) Hamza and Al-shhri defined a left derivation in BCI-algebra and invesitigated a regular left derivation. Tamilarasi and megalai(2010) Introduced another type of algebric structure TM-algebra,which is generlaised by BCK/BCI-algebras. T. Ganeshkumar and M. Chandramouleeswaran (2013) introduced the notion of introduced the notion of derivations on TM-algebras. In this paper, we introduce the notion of t-derivation on TM-algebras. We study the properties of regular t-derivations on a TM-algebra and prove that the set of all t-derivations on a TM-algebra forms a semigroup under a suitable binary composition. Kyung Ho Kim (2016) introduced the notions of fixed set and kernel set of generalized derivations in a BCH-algebra and obtained some interesting properties in medial BCH-algebras. Also, we discuss the relations between ideals in a medial BCH- algebras. Ganshkumar.Takbar Paad(2017) introduced the notion of radical of ideal in BL-algebra,with respect to concept,w characteriz the notion of the redical of idal by elements of BL-algebra. In(2017) Hashem Bordbar , Mohammad Mehdi Zahedi and Young Bae Jun introduced the notion Relative Annihilators in Lower BCK-Semilattices and show that the relative annihilator of an ideal with respect to an ideal in a lower BCK-semilattice is an ideal, and we discuss conditions for the relative annihilator of a subset with respect to a subset to be an implicative (resp., positive implicative, commutative) ideal. In(2017) M.kaviyarasu and K.Indhira we developed algebric system called INK-algebras and Invstigated some of its properties.

## 2   The Fuzzy Set Concept On Algebras

The concept of fuzzy set theory introduced by Zadeh(1965) has been show to be useful tool to describe situation in wich the data are imprecise and vague.Fuzzy sets handle such situations by attributing a degree to which certain objects belong to a set.  The concept of fuzzy set was first applied to theory of groups and thereafter,many researcher introduced thias concept to other algebraic structures such as semigroups,ring,ideal,modules,vector spaces and interesting result have been reported in the literature. Xi(1991) applid the concept of fuzzy set to BCK-algebras.since then,a great volume of literature has been published on the theory of BCK/BCI-algebras. Dudek and Jun(1991) considered the fuzzification of BCC-algebras.it has been show that every fuzzy BCC-ideal is a fuzzy BCK-idea and the convers is not ture with suitable case studies.It is proved that in a BCC-algebra and in a BCK-algebra,the notion of a fuzzy BCK-ideal and fuzzy BCC-ideal coincide. Dudek and Jun (2001) discussed the relationship among fuzzy BCK-ideal,fuzzy BCC-idal and fuzzy g-ideal,fuzzy characteries of g-ideal and also fuzzy relation on BCC-algebras. Sun Shin Ahn and Hyun Deok Lee(2004) classified the subalgebra by their faamiles of level subalgebra in BG-algebra. Akram (2005) fuzzified d-algebra and discussd the carteasian product two fuzzy set and the relation between subalgebra and upper level sets.it showed that in the d-algebra every fuzzy d-ideal is a fuzzy d-algebra and fuzzy d-ideal of a d-algebra is a fuzzy d-subalgebra. In (2014)T.Priya and T.Ramachandran Introduced the concpet of some characterization of Anti fuzzy PS-ideal of PS-algebras in homomorphism and cartesian product and investigate

how to deal with the homomorphism and cartesian product and obtain some of its result. osama Rashad Ei-Gendy(2015) introduced notion Anti-fuzzy BRK-ideal of BRK-algebra and we study the image and the into homomorphic ,invers image of anti fuzzy BRK-algeba.

## 3   The Intuitionistic Fuzzy Set Concept On Algebras

Atanassov (1986) introduced the concept of intuitionistic fuzzy set,which contribute an extension of fuzzy sets theory.Intuitionistic fuzzy sts give both a membership degree and non-membership degree.The only constraint on these two degree is that their sum must be simaller than or equal to one. Jun and Kim(2000) eatablished the intuitionistic fuzzification of the concept of subalgebras and ideals in BCK-algebra,and introduced the notion of equivaence relation on the family of all intuitionistic fuzzy ideal of a BCK-algebra and investigating cantain related properties. Jianming Zhan and Zhisong Jan(2004) introduced th concept of Intuitionistic fuzzy $\alpha$ -ideal in BG-algebra and invesitigated its propertics. Kim and Jeong (2006) defind intuitionstic fuzzy subalgebra of B-algebra which are related to several class of algbra such as BCI and BCK. Peng Jiagin(2010) established the intuitionistic fuzzification of th concept of ideal in BCH-algebra with appropriate example,studied the homomorphism image and inverse homomorphic image of intuitionistic fuzzy ideals. Bavanari satyanarayana al(2010) introduced the concept of intuitionistic fuzzy H-ideal in BCK-algebra and they showed that if A is an intuitionistic fuzzy closed H-ideal of BCK-algebra X. Tamilarasi K and megalai.A (2011)introduced the concept of intuitionistic Q-fuzzy T-ideal in TM-algebra and also give some example of Q-Fuzzy T-ideal in TM-algebras. Tapan Senapati , Monoranjan Bhowmik and Madhumangal Pal(2012) introduced the notion of interval-valued intuitionistic fuzzy subalgebras of BG -algebra. Also defines homomorphism of interval-valued intuitionistic fuzzy BG-subalgebras and investigate some of their properties.Interval-valued Intuitionistic Fuzzy BG-subalgebras. Tapan Senapati, Manoranjan Bhowmik and Madhumangal Pal (2013) introducd the new notion of The an interval-valued fuzzy closed ideal of a B-algebra is introduced, and some related properties are investigated. Also, the product of interval-valued fuzzy B-algebra is investigated. Saleem Abdullaha and Naveed Yaqooba(2013) introduced the notion of direct product of intuitionistic fuzzy H-ideal of BCKalgebras and some related properties are investigated. Characterizations of direct product of intuitionistic fuzzy H-ideals of BCK-algebras are given. Shaoquan Sun, Qianqian Li(2014) Based on the theory of intuitionistic fuzzy sets, the concepts of intuitionistic fuzzy subalgebras with thresholds $(\lambda, \mu)$ and intuitionistic fuzzy ideals with thresholds $(\lambda, \mu)$ of BCI-algebras are introduced and some properties of them are discussed. B.Satyanarayana,L.Krishna and R.Durga Prasad (2014) the notions of intuitionistic fuzzy (weak) implicative hyper BCK-ideals of hyper BCK-algebras and then we present some theorems which characterize the above notions according to the level subsets. Also we obtain the relationship among these notions, intuitionistic fuzzy (strong, weak, reflexive) hyper BCK-ideals, intuitionistic fuzzy positive implicative hyper BCK-ideals.

## 4    conclusion

From the above literature it is decided to work on a new class of algebras called INK-algbras.The proposed concept of INK-algebra,in present work ,has been evaluated against well established algebraic theorems.It has been observed that the INK-algebra satisfies various conditions stated in the TM/Q/BCH/BCI/BCK/BCC -algebras.

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